

The AUTOMOBILE

Forces at Work During 1914 —The Year Review

Industry Grows In Spite of Financial and Industrial Depression
—Epoch-Making Forces Launched—Conservative Activities a Characteristic—Factory Additions

DURING the year just closing the automobile industry has made most material progress, notwithstanding the financial and industrial depression which has settled more or less uniformly over the entire country. This continued prosperity, in the midst of general retrenchment, can only be attributed to the part the automobile is playing in business and private life, testifying to the fact that no longer can the automobile be considered a vehicle of luxury for the classes, but it must be interpreted as a vehicle of necessity for the masses.

Healthy Condition Country-Wide

THIS premise is based on the fact that the healthy condition has been generally country-wide, with the sole exception of those cities or localities where local conditions have been dominating factors.

Industrial and financial prophets told how on the outbreak of the war the automobile industry would suffer more than older established industries, industries that played a more useful rôle in carrying our great nation along on the highway of destiny, but the records since that memorable Saturday, July 30, show that the automobile industry is not a youngster, not a luxury, not a sunny-day industry, but that already this dominating industry of the twentieth century has taken a high place in the gamut of national importance, a position so necessary that even the restrictions brought about by the great war have not laid it low, as was anticipated; rather the automobile industry bids well to once more demonstrate that since its inception each

succeeding year has been a bigger one than its predecessors, and that this is at least one industry that has grown from year to year, notwithstanding adversaries in the shape of industrial and financial misfortunes.

Industry Unequally Affected

ALL branches of the industry have not prospered to the same extent, those divisions that have appealed to the masses with special fascination having suffered least by war and financial and industrial stringency. The passenger car industry suffered less than the motor truck department, business houses from the opening of January evidencing more or less distrust, due unquestionably to the general state of national unrest and expectancy, based on how the varied governmental changes were going to work out. The passenger car market opened and continued active until the war cloud gathered, after which date trade in the higher-priced vehicles fell off most perceptibly, but business in the lower-priced types continued with amazing steadiness. The abundant cotton crop in the South with the poor market developed a condition local to cotton-producing states, which has prolonged itself to the present, when there are symptoms of general invigoration throughout that territory.

The accessory market has kept pace with car and truck production, but since August 1 general buying has been below par, a condition explained in many cities by the conservative money atmosphere, and in our larger cities because many automobiles were

placed in winter storage months earlier than in previous years.

For several months the attitude of banks in many cities of nearly every state in the Union has not been conducive to business optimism, particularly with the dealers. Not a few banks have been slow to advance funds to dealers in payment for automobiles shipped on bills of lading, these banks apparently considering it a poor risk to make advances of this nature with automobiles as collateral. In some sections there appeared to be a concerted movement among certain banks to discourage dealers' business. Many banks consider advancing money in payment for unsold cars a poor risk, but modify their decision in nearly every case, namely, that the financial and business career of the dealer is invariably a factor to be considered. At the other end of this banking attitude are those factories desiring to raise funds from banks to pay for raw materials to be used in the manufacture of automobiles on which deposits have already been placed by the dealer. Refusing to assist the dealer in his purchase of cars and further refusing to aid in financing the maker has worked not a few hardships, but, thanks to a general movement intended to improve these conditions, it is anticipated that few serious damages will result.

Patent Litigation Continues

IT has become historic with the automobile industry to link with it an almost endless trail of patent litigation, a trait of character bestowed on the industry through Selden litigation before it was out of its swaddling garments. Three years ago when the Selden case was settled it was anticipated that this demoralizing dissension had passed, but nearly every month of the present year has witnessed new activities in the courts. Throughout the season litigation on electric motor horns and hand-operated horns has been fought with the keenest edge, and only recently has it appeared that the end was in sight and that both makers and dealers would have this nightmare eliminated. These fights have been carried through the local courts, through the courts of appeal and through the various divisions of the patent office, and the end is not yet.

Kardo Patent Situation

MORE industry-wide litigation was launched in March with the organization of the Kardo company controlling patents on floating axle, front axle and other constructions. So broad has this conflict become that the national organization, the National Automobile Chamber of Commerce, Inc., has not only conducted a comprehensive investigation in this country but also in Europe on the patent situation as affecting these lines, and at its last meeting decided to fight suits against any of its members on these patents, the validity of which has yet to be established in the courts. There have been some other important decisions handed down during the year, one in favor of the Hess-Bright company on bearings, another declaring the Knobby tire patent invalid, a decree forbidding the

refilling of Prest-O-Lite tanks, and one in favor of the Motometer.

S. A. E. Activities Broaden

OUR national engineering society, the Society of Automobile Engineers, has prospered. Its activities have been considerably broadened since January 1. The present administration opened its régime auspiciously by improved financing of its standards committee work by obtaining from the National Automobile Chamber of Commerce, Inc., a substantial donation, which has enabled the society to pay railway mileage to the members of its standards committee attending quarterly standards meetings in New York. The result is a greatly increased attendance at these meetings and higher efficiency from those attending. This was the first year in which these standards meetings have been conducted quarterly, and the progress made in arriving at new standards, eliminating others that have proved useless, or writing specifications of metals off the data book, indicates the broad grasp of the problem by the present administration.

Approximately one-third of the specifications of steel have been removed from the data book. The work of adding new standards has gone perhaps more slowly than formerly, the standards committee as well as the various sub-standard committees preferring to make progress very slowly to that less conservative policy of doing only to undo a year or so hence.

Besides the iron and steel specifications the society's standards committee has made important strides toward the standardization of many of the parts for commercial and passenger vehicles. Twelve new standards have been adopted during the year. The introduction of the Cleveland section to the society is also a step in advance, as it is through the monthly section meetings in various cities that the work of the society is materially advanced.

Eight-Cylinder Cars

THE year of 1914 has been one prolific in engineering upheaval, and whether some of the developments that have taken place in the industry can be designated as progress only the passage of years will determine. The eight-cylinder motor has made its début, has been adopted by two makers and gives promise of adoption by several more before 1915 is many months old, widespread activities pointing in this direction having been well known for several weeks. The eight-cylinder is not new; France has built it in a limited quantity for many years; it has been sold in considerable numbers in America, and against its success nothing can be said; but the American maker is catering to a fastidious buying clientèle, and it will only be after the eight has been tried against the six and the four that the final trend can be deciphered. The return to the smaller four is a characteristic, not spectacular but yet present.

Many other engineering movements have taken shape during the year, the cord tire, new systems of gasoline feed, etc., but these are reserved for the

engineering review of the year to appear in THE AUTOMOBILE for December 31.

Factory Financing Conservative

THE year has not been spectacular with big financing schemes, with the gathering together of many small units or factories into large organizations, such as was the order a few years ago; rather factory financing has been comparatively conservative, money not being over abundant for manufacturing enterprises. Yet the year has not been dormant, no fewer than twelve out of sixty-six of our leading automobile companies having increased their capital during the year to the extent of \$8,762,000, or an average of \$13,275.75 per concern. With some this new capital has been needed to take care of building operations; with others it has been required for expansion and increased production.

In the truck field, four out of twenty-nine companies increased their capital over \$2,800,000.

In the accessory field this program of enlargement has been carried on and, although it is impossible to give reliable figures, our compilations show, of about 150 leading makers, fourteen have increased capital to the grand total of \$2,318,000.

Substantially Increased Profits

A RÉSUMÉ of annual statements published during the year discloses in general favorable financial conditions, nearly all of our concerns showing substantially increased profits. The Ford statement showing its accumulated profits of \$48,000,000 is abnormal and is far in advance of the general condition. It should not be accepted as even indicating the average condition. On the other hand, the General Motors issued a most creditable statement, revealing profits of \$7,947,413; the Willys-Overland statement was particularly good, with profits of \$5,864,858, as compared with \$5,705,537 for the previous year. The Packard statement showed a surplus of \$1,797,820.42 for the year; Goodyear handed down a report showing \$3,091,165 over previous years, and a general résumé brings to the surface many very favorable financial records.

Nineteen hundred and fourteen can be recorded as a year approaching the average in the amount of factory building activity embracing the occupancy of new factories and the erection of additions. Several new factories have been occupied, these including Gray & Davis, Paige-Detroit, New Departure, Stutz, Ever-Ready and others. Those included in the list of additions to present facilities are Overland, Reo, Hudson, Kissel, Stutz, Vulcan, Hupp, Dodge Bros. Among the truck concerns making additions are: Lippard-Stewart, Kelly-Springfield, Four-Wheel Drive, Nelson & LeMoon and Motokart.

Very general activity in increasing factory facilities marks the accessory industries, such increases being too numerous to mention here. They are to be found elsewhere in this issue.

A brief enumeration of what some of these individual concerns have done and the money ex-

pendent will serve as a conservative criterion of building progress, the detailed program of the different concerns appearing on other pages of this issue, where many of the new factories or additions are illustrated.

Increased Car Production

WITH increased factory facilities we look to increased production, and it would be disappointing if we did not meet with many evidences of increased production for the year as compared with 1913. Briefly analyzing state registration figures for the year substantial increases are found. Total registrations for the country up to October 1 are 1,735,369 as compared with 1,253,875 for the 12 months of 1913, this showing a gain of 481,494, not taking into consideration the last 3 months of the present year. The 1914 registrations for the twelve leading states up to October of the present year all exceed the total registration for the 12 months of last year. For New York State the total on December 17 was 155,000, as compared with a total of 122,411 for all of 1913, this allowing for duplicate registrations. Some of the increases in other states for 9 months this year against all of last year are: Pennsylvania, 46,595; Ohio, 32,896; Illinois, 32,025; Iowa, 29,889; Texas (estimated), 20,638; California, 58,061 (partly due to new registration law); Michigan, 20,411; Indiana, 21,962; Nebraska, 14,955; Missouri, 12,472, and Massachusetts, 12,140.

Profit-Sharing Shows Results

FROM a financing viewpoint, Henry Ford's cooperative profit-sharing plan with his employees announced in January immediately became a matter of international interest, and since then the announcement of the price reduction of \$60 per car and of his additional plan to rebate \$40 to \$60 to every buyer of a Ford car upon the condition that 300,000 are sold in the period from August 1, 1914, to August 1, 1915, has done much to demonstrate the magnitude of the organization and the efficiency with which it is conducted. The announcement of a surplus of \$48,827,032.07 in the annual statement, with \$27,441,468.79 cash in the banks, have substantiated previous convictions.

Up to the present approximately 87 per cent. of the employees have qualified as eligible to participate in the profit-sharing plans, and an analysis of the factory force shows that Ford's plan was based on broad ethical plans, foundation stones mutually profitable to employer and employees. The movement must be considered a revolutionizing one in the industrial field.

War Affects Export Business

THE year 1914 opened auspiciously for automobile exports, but unfortunately this desirable program was cut short by the war. Not only was our foreign business increasing with Europe, particularly in the low-priced car field, but statistics from Australia showed that the United States exported the most automobiles to the Antipodes, but that the total value of British car exports exceeded

those from America by \$455,100, amounting to \$1,491,525, while the American cars were valued at \$1,036,425. Comparing this year with previous years, America's trade with Australia has been developing very rapidly.

Our South American business has not shown the improvement that was anticipated, partly due to the handicap our makers are under in not having American banks with branches in the leading South American cities. Fortunately one of our leading banks has already opened a branch in Rio de Janeiro and expects to have another branch opened in Buenos Aires before many weeks, so that this enterprise, together with the credit reports already being compiled, should greatly facilitate our business in many of these Latin-American countries. The most of South America has been under a moratorium since the opening of the war, and naturally business opportunities are not the most inviting, particularly as Europe was the banker for South America. Now with this banker engrossed in war the new program is that of our having to develop sales in a land not naturally favorably disposed to us and of having to finance the deals as well. No mean program, and one that calls for the best genius of our industry. But in spite of depression, not a few of our car and accessory concerns have dispatched special trade emissaries to these Latin-American countries with the grim determination of building up a trade along the same lines as the European experts in export fields have done, namely, locating in these lands, studying the characteristics of the people, analyzing the business methods, and preparing plans accordingly.

Passing of the Cyclecar

INDUSTRIALLY the wane of the cyclecar movement, in fact, you might almost say the elimination of the movement for the present at least, must take its place as one of the industrial cycles. The opening weeks of the year saw a perfect tidal wave of cyclecar enthusiasm. Concerns were being incorporated nearly every day, a national organization was formed of the manufacturers, a national sport-governing organization was launched, but today little is heard of the typical cyclecar. A score, perhaps two score, of the concerns have discontinued, and now the movement is to the conventional miniature car, a vehicle with a four-cylinder motor, a two or three-speed gearset, shaft drive, steering and general running gear details in conformity with standard practice. This trend of the cyclecar movement is a page from the history of the industry in England, where the cyclecar was conceived.

Why the sudden eclipse in America is difficult to answer, many factories combining. There was much stock-jobbing indulged in, selling stock on vehicles that were on paper but which had never reached the practical stages. There were many cyclecars launched without being backed up by sufficient engineering talent, and these had to go the certain path of the weak. There were many concerns not sufficiently backed financially to carry on production. But the public was not ready for the

cyclecar. Tandem seating was an innovation; the narrow tread was not liked; you sat too much in the dust zone and too near the poles of horse wagons. There unquestionably will be a revival of the movement, perhaps more along the miniature car lines, with standard treads, until such times as our highways over all the states resemble our city boulevards.

A Good Contest Year

THE year has been an active one in contests, the official report of the American Automobile Assn., the official sport-governing body of the automobile industry, showing a total of 120 sanctions issued for the year, as against 101 in 1913, 132 in 1912, 117 in 1911 and 166 in 1910. Speedway and road racing enjoyed the major share of the sporting season, hill-climbs and reliability or endurance contests having a very scant following. The last few months have been considerably enlivened by the many certified trials held by different makers and conducted under official sanction by accredited technical representatives. These trials can only be interpreted as a striving for more accurate engineering information, and whether their mission is to determine fuel economy, tire efficiency, low-gear ability, etc., there is but one comment, namely, that they have stimulated critical interest in their line and should be emulated by many other makers.

The Tire Industry

THE tire industry has had a relatively peaceful existence since January 1 and the new year will witness approximately the same tire prices as ruled a year ago. The war caused a brief flurry, the price of crude bounding in a few days from 55 cents per pound to \$1.10. There was an upshot in prices and something in the nature of a stampede among dealers to move the goods on hand. Owners bought very generally, and big stocks were moved, the feeling being that the importation of plantation rubber from the East Indies through London might be endangered by the war, particularly if Great Britain, who handled the rubber situation, should not maintain strict control of the high seas. Within a few weeks after the declaration of war the situation cleared and crude fell to normal, but the last month has brought renewed anxiety, due to the embargo placed on crude by Great Britain. It is not known when this embargo will be lifted and whether it was enforced due to the feeling that much of the crude brought from the east in British bottoms was eventually reaching her enemies, or whether the possibilities of interruption in the Suez Canal trade because of the Turkish hostilities was the dominating factor. As it is, the embargo remains and crude is about 80 cents per pound, with little hope of much East Indian production arriving in the immediate future.

Crude from the East Indies plays a very material part in the tire industry, in spite of the much-heralded Para gum from South America. The quantity of Para gum used in our tires is small as compared with that of plantation rubber from the East.

1914—A Good Contest Year

High-Speed, Small Bore Motors the Engineering Feature in Racing—102 Sanctions Granted—Speedways Popular—Many Individual Tests of Stock Cars for Speed and Economy

CONTESTS in 1914 attracted slightly more attention than a year ago, although few additional factories lent their support. Not more than one large concern, Maxwell, entered the field with specially-built racing machines and a comprehensive corps of drivers. Speedway races showed increased popularity, Indianapolis, Sioux City, Ia., and Tacoma, Wash., staging very satisfactory meets. Road racing was scarcely up to the mark of 1913, Elgin, Santa Monica, Corona and the desert duel between Los Angeles and Phoenix, being the major events. A very perceptible improvement took place in events on circular mile horse tracks. A series of 100-mile races with purses of \$1,000 for winning, with good second and third money, drew the best racing talent and proved very popular.

Many Certified Trials

A most satisfactory development in contests during the year was the certified trials movement, in which individual car and accessory organizations took out sanctions and had trials made on fuel consumption, for low-gear traveling, for speed for 1 hour or longer, etc. These certified trials created a great deal of interest, and did much to stimulate sentiment.

More makers than ever before availed themselves of the Indianapolis speedway for private speed and other tests and concerns which have long been out of racing held several official speed tests.

The hill-climb movement was at the lowest ebb for several years, only two climbs of importance being staged, one at Atlanta, Ga., and the other at Uniontown, Pa. Wisconsin had the only large reliability contest and there were fewer sociability and short outing trips than formerly. The inter-club contests promoted for years in Chicago were continued with old-time success. Only one large competitive fuel economy test was held, it being conducted in Harrisburg, Pa.

Small High-Speed Motors

From racing results the dominating conclusion was the great performance of the small, high-speed motors, cars of 300 cubic inches or under showing higher maintained speeds than large 450- or 600-cubic-inch motors of previous years. The years of work that Europe has been expending in the development of the small high-speed, high-efficiency motor were well demonstrated at Indianapolis' 500-mile race, where an especially small car finished second. It can be accepted that 1914 definitely proved the fallacy of the large motor and heavy chassis for long-distance speedway or road races. The small motors with four valves per cylinder gave a wonderful account of themselves, both in America and abroad. More valve-in-the-head motors were used than ever before, though while these won the majority of races, the records of the year were established at Corona with a Mercer T-head design.

Cord tires came before the public more than ever before, and contests of 1914 proved as conclusively as previous years that car weight, car balance, and the resulting tire wear are still the controlling factors in racing.

Few Stock Car Contests

Unfortunately practically all contests were for non-stock cars, and it was exceedingly interesting when at certain times certified speed trials of stock cars demonstrated that we have stock cars that can maintain high speeds for 1 hour or longer, and that the public would still be greatly interested in more stock car performances.

In 1914 the Contest Board of the American Automobile Assn. issued 120 sanctions as compared with 101 last year, 132 in 1912, 117 in 1911 and 166 in 1910. A further analysis of the 120 sanctions issued in 1914 shows that fifty-two were on 1-2-mile dirt tracks, thirty-six on 1-mile dirt tracks, ten were road races, eight reliability tests, two hill-climbs, four certified trials, and one each of beach races, commercial vehicle tests. The Indianapolis, Tacoma and Sioux City speedways were the only ones to receive sanctions during the year.

This segregation indicates a falling off in the number of road races, which is explained by the fact that 1914 saw few class races, there being really only six events of major calibre, the Grand Prix and Vanderbilt at Santa Monica, the Chicago Automobile Club cup and the Elgin National trophy at Elgin, Ill., the Los Angeles-Phoenix desert race and the Corona races. In 1913 San Diego had three road races, Corona had two and Tacoma had three. This year San Diego was not in the running, Corona had only one, and Tacoma was put into the speedway category. Both the Los Angeles-Sacramento and Albuquerque-to-Santa Fé road races were abandoned this year.

Although road races in 1914 were fewer than ever before, yet the number of starters was 105 per cent. greater than in 1913 and the largest since 1911. There were 170 starting in the ten races whereas, in 1911, 202 started in twenty-seven events.

An Increase in Speed

This year showed an increase in speed. In each of the five classics the previous record for that particular race was beaten: De Palma's record of 75.49 m.p.h. for the Vanderbilt beat Mulford's mark of 74.07 at Savannah; Pullen raised Bruce-Brown's mark of 74.45 for the Grand Prix at Savannah to 77.2 at Santa Monica; De Palma raised the Elgin course mark from 66.8 to 73.9 and the Elgin National, formerly held by Gil Anderson at 71.5, to 73.53 and Pullen raised his old mark of 75.03 at Corona to 87.7.

This year saw about the same number of makers supporting racing teams, there being forty-seven makes represented as against forty-six in 1913, forty-four in 1912, forty-four in 1911, fifty-five in 1910 and sixty-three in 1909.

New speedway records were made at Indianapolis in the 500-mile race. These ranged from 20 miles up to 500. Old-field in the Stutz gets the 20 and 25-mile marks and all the others go to the foreign cars. Speedway racing seems to have come into its own, for this year there were five races in this category, each won by a different driver and car. The Indianapolis 500-mile race was won by René Thomas in a Delage; Sioux City's 300-mile event went to Rickenbacher in a Duesenberg, and at Tacoma, the winners were Cooper, in a Stutz; Hughes in a Maxwell, and Parsons in a Frantz.

The year of 1910 was the next largest for speedway events, there being then three speedways in operation, Indianapolis, Atlanta and Los Angeles. In 1915, Indianapolis, Sioux City and Tacoma, it now appears, will be augmented by big tracks at Minneapolis, New York City, Omaha, and Chicago.

Races Longer Than Before

Referring back to road racing it is shown that another tendency noted this year was to make the races longer and the ten road races totaled to within 130 miles of the distance covered in the sixteen races in 1913. This gives 1914 the record average mileage with 354 miles as against 207 in 1913, 243 in 1912, 206 in 1911, 211 in 1910 and 211 in 1909.

The average time of all the finishers, too, was better, the figures giving 54.91 miles per hour, as against 54.68 in 1913, 54.49 in 1912, 59.51 in 1911, 51.58 in 1910 and 50.62 in 1909.

The average time of each winner was slower than those of 1911 and 1912 and faster than 1913. The following gives the average time made each year: 1914, 58.69; 1913, 57.7; 1912, 60.25; 1911, 63.22; 1910, 53.8 and 1909, 49.2.

Racing on 1-mile circular dirt tracks was more popular this year. A series of 100-mile races with keen competition between such drivers as Burman, Mulford, De Palma, Tetzlaff and Alley, brought large attendances. It is remarkable that in each of these races the 100-mile dirt track record was broken. First De Palma broke it at Brighton Beach, by making it in 1:40:15, then Burman at Kalamazoo, lowered that mark to 1:34:29 to 1:32:54 at Galesburg, and to 1:31:30 by Alley in a Duesenberg at Hamline.

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S. A. E. Advances Along Three Broad Lines

Standardization, Research and Social Activities
Advanced—Over Sixty Papers Read—Twelve Sets
of Standards Adopted—Cleveland Section Added

WHEN President H. M. Leland of the Society of Automobile Engineers spoke at the last Summer session of making two blades of grass grow where but one grew before, he struck the keynote of progress for the society. The organization has three broad lines of endeavor which may be laid down as the promotion of standardization in manufacture, research and the promotion of good fellowship and acquaintance among the men who make up the automobile industry. Along all these three lines Mr. Leland can truthfully state that the close of his administration sees many more blades of grass than the beginning. Progress has been made.

Twelve New Standards

In standards work, the addition of twelve new sets of adopted specifications and the modification and simplification of several others are milestones along the march of the committees in charge of this work towards the goal of maximum efficiency and economy in the manufacture of automobiles. The adoption of S. A. E. standards by other recognized engineering bodies is another important step. The Electric Vehicle Assn. has adopted the standards of the society as regards the electric vehicle in toto. The American Society for Testing Materials is considering the adoption of the entire list of S. A. E. steels. The recognition and confidence of other engineering bodies is a big factor in the success and growth of the society.

Over Sixty Papers

The fruits of research are the papers which are brought before the society for discussion and which then enter the transactions as a part of the permanent records. These papers not only represent private research but are also the reports of committees which have been definitely assigned to the work. In this committee investigation work the sections of the society have been a great factor and the work of committees on such subjects as gasoline-electrics, kerosene carbureters, etc., is bearing fruit in the shape of valuable data for use as reference in future developments. During the year more than thirty papers have been presented before the sections for discussion and at the two semi-annual conventions there were thirty-one others,

fourteen in January and seventeen in June. Thus a total of more than sixty papers on selected subjects and the discussions which resulted from these have become part of the records of the society during 1914.

Cleveland Section Added

On the promotion of acquaintanceship it is impossible to set an accurate gauge. The social end of the society's work is aided to an immeasurable extent by the monthly gatherings of the four sections in New York, Detroit, Indianapolis and Cleveland. The last named section is another of the steps forward during the year as it has come into existence but recently. Probably the biggest opportunities for the formation of friendships are the semi-annual conventions. This year, as in the past, the winter session was held in January in New York City. The summer session was held on the sands of Cape May, N. J.

A step forward in the work of the standards committee has been made in the practice of holding a standards committee convention previous to that of the regular semi-annual conventions. This affords the members of the committee a chance to organize their work and establishes a firm stepping stone on which to base their reports to the society as a whole. In order to promote the best possible attendance at these important meetings the mileage of the members of the committee is now paid by the society. At the last convention of the standards committee held in October, seventy-five members registered during the progress of the meeting which occupied 3 days.

During this time the reports of twelve divisions which are actively engaged in the formulation of standards were heard. This offered the opportunity of telling the manner in which the specialized work was being conducted and enabled the committee as a whole to offer suggestions and discuss the manner in which the reports will be made to the entire society at the January 1915 session.

Fewer S. A. E. Steels

At the meeting in January 1914 eight new standards were adopted. At the summer session there were four others, making twelve new sets of standards for the year. These covered broaches, truck tire sizes, insulation tests, storage bat-

tery dimensions, battery rating, air pump dimensions, spark plugs, cotter pins for yoke ends and sets of specifications for S. A. E. alloy and carbon steels. In the iron and steel standards the adopted reports were in the line of simplifications of existing standards through the elimination from the list of steels, several that were not used to a sufficient extent to justify their retention.

Twenty-nine subjects are now engaging the attention of the society in regard to their standardization. These are noted in the accompanying table.

Many of these subjects are so broad that they are naturally subdivided and have certain portions of the work in the hands of sub-committees.

In the internal management of the society there have been several important milestones passed. The adoption of a new constitution which incorporates many features which broaden the work is one of the most important. The question of student enrollment is of great importance in the work of the society in developing men for the automobile industry. At the June meeting it was suggested that a paragraph be added to the constitution of the society putting it within the power of the council to enroll bona-fide students of automobile engineering under 30 years of age and for the sum of \$3 annually allow them to receive the Monthly Bulletin of the society. To enter as a student, the endorsement of a member of the society and the approval of the council is necessary. Three student enrollments were approved during November.

Nine Tire Sizes

There are many steps in the standards work, which, although not adopted by the society this year, really belong to the year's work. One of the most important of these, both to the manufacturer and the user of cars, is the standardization of pneumatic tire sizes. There are now fifty sizes manufactured. If the proposed standard becomes a part of the policy of the tire makers there will be but nine, exclusive of the oversizes. The tire makers are heartily endorsing this stand because it will not only be a source of economy to themselves but will also work a benefit to the dealer, who will be able to keep himself stocked more readily and to the user because he will have less

difficulty in securing the size tire he wants.

The sizes of tires which the division in charge of this work recommends for adoption as standard are the 30 by 3; 30 by 3 1-2; 32 by 3 1-2; 32 by 4; 34 by 4; 34 by 4 1-2; 36 by 4 1-2; 38 by 5 1-2, and 36 by 5. The feasibility of reducing the fifty odd sizes of tires to the above nine will be realized when it is understood that 85 per cent. of the tires on cars now in use are among the sizes mentioned. The society expects that tire makers will manufacture oversizes for these tires but that the makers of cars will adopt one of these standard sizes, allowing the user to fit the oversize should he deem it necessary, owing to the carrying of more than the weight for which the cars are designed or for roads of more than ordinary capacity for tire wear.

Cars Undertired

The question of tire equipment has been dealt with more extensively this year than any other. It is stated in the reports of those who have investigated conditions for the pleasure car wheels division that more than 90 per cent. of our cars leave the factories with a greater load on the tires than the average prescribed by the tire making concerns. For this reason a special committee is considering the economics of using larger tires with less inflation. While this matter will fall into next year, its initiation is one of the features of accomplishment during the 1914 season.

Many of the fittings under the jurisdiction of the miscellaneous division are of importance. A new spark plug, not to replace, but to supplement the present S. A. E. standard plug is suggested. This will take a larger porcelain than the old standard plug and the dimensions will be such that it can be screwed into place by hand, the final tightening only being made with a wrench.

A work of great importance to the society is the maintenance of the data sheets which are issued in loose leaf form. Under chairman B. D. Gray of the data sheet division the work of keeping these sheets up to date has taken on a new life. The result has been the entire revamping of the data sheets. They now keep pace with the work of the standards committee and as a result are to be found on the desks of draughtsmen and engineers as instruments of active use. The standards so far adopted are printed on these sheets together with a large amount of valuable data in the shape of tables and engineering facts and formulæ.

A new division of the standards committee which will doubtless prove of value in keeping the S. A. E. in touch with the outside world is the standard exchange division. The function of this

body is to keep abreast of the standards and engineering practices adopted by the society and by written communications and conferences arrange that the established standards of other organizations harmonize with those of the S. A. E. insofar as it is practicable. In addition to the E. V. A. and the American Society for Testing Materials the division is working in conjunction with the Automobile Engine Manufacturers Assn. A definite aim in conjunction with the work of this organization is the adoption of a standardized set of dimensions for bell housings for unit power plants. This would lessen to a large extent the troubles of the parts manufacturers in designing clutch housings and gearboxes and would tend towards reducing the prices on these units.

Throughout the year a question which has been a source of considerable debate in the society and which now seems to be solving itself is that of the single vs. two-wire scheme in installing electric lighting and starting outfits. At the summer session of the society the standards committee brought to the society as a whole the resolution that the single-wire system be adopted as recommended practice. A warm debate ensued on this in which it was brought out that many of the members did not think that the single-wire system was safe. The objection urged against it was the risk of fire and the complications necessitated by the installation of fuses. No decision could be reached. Since that time the division to which the matter was referred back states that of the 1915 cars 220,000 will be equipped with single wiring and 98,000 with double wiring. It is felt that in view of the remarkable trend towards the single wire system a recommendation by the society would be superfluous. The information upon which the facts are based comes from a declaration of the intentions of thirty-eight makers. Twenty-seven of these favored the single wire and eleven the double wire.

Owing to the agitation against glaring headlights which was inaugurated early in 1914 in many of the largest municipalities, resulting in legislation which had different requirements for lights in dif-

ferent cities, it was thought that the matter should be investigated by the standards committee of the society. In this connection a sub-committee was appointed by the electric equipment division. It will be the work of this committee to determine a standard method of measuring the quantity of glare in order that some basis will be had upon which to base a uniform legislation. This work is well under way and must be included in any review of the progress of the year.

Standards Are Used

All the work of the standards committee as reviewed in these pages is the product of work which stands out owing to its timely importance. In addition to this, however, there is a large amount of technical data which has been evolved as the result of patient and painstaking effort on the part of the committee in gathering data from the makers.

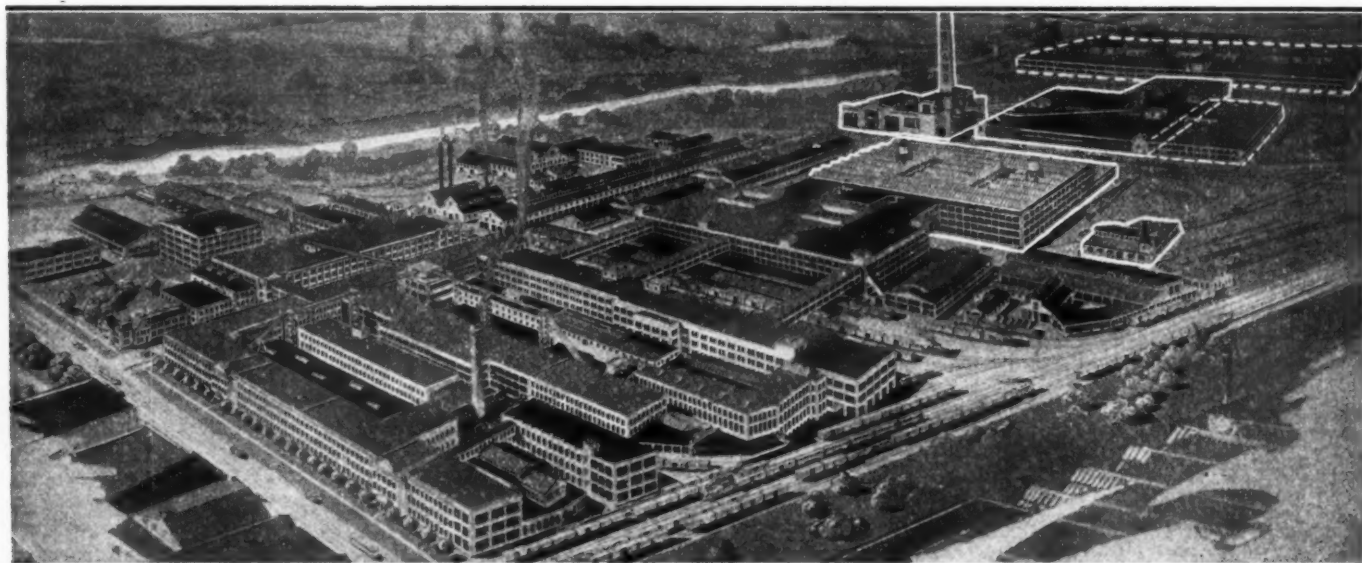
The proof of the pie is in the eating and in the standards work the eating of the pie is paralleled by the using of the standards in the actual work of designing the cars. The year of 1914 can truthfully be said to have seen a considerable advance in this respect. Car manufacturers who are turning out products which are to a large extent assembled are learning to specify S. A. E. standards for their parts. The axle and gearbox manufacturers bring ample testimony as to this and none are more active participants in the actual work of the standards committee as well as in the discussions on the standards than are these makers. The contributions of the tire makers towards the adoption of a series of standard tests on demountable rims is one of the bright spots in the technical history of the standards committee work, showing that manufacturers whose industries are affected by the standards investigations are willing to lend time, men and money to the efforts to produce standards that will cut manufacturing costs.

It is to be regretted that the European war cut short the negotiations for the foreign visit this year. Many had expressed their intention of participating.

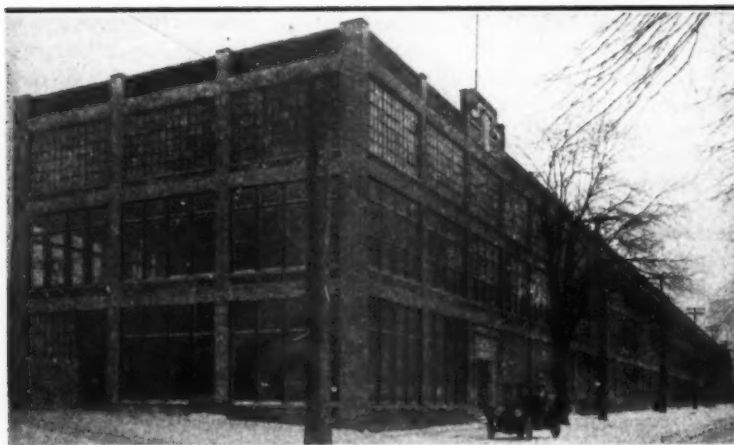
Subjects Now Engaging Attention of S. A. E. Standards Committee

- | | |
|--------------------------------|--|
| 1—Truck wheel felloe bands | 16—Cotter pin sizes |
| 2—Truck wheel tire clamps | 17—Physical properties S. A. E. steels |
| 3—Anti-glare devices | 18—Steel casting specifications |
| 4—Single wire fittings | 19—Pneumatic tire sizes |
| 5—Lamp nomenclature | 20—Tire inflation pressures |
| 6—Lamp fittings | 21—Demountable rims |
| 7—Lamp bracket dimensions | 22—Roller bearing sizes |
| 8—Junction boxes | 23—Thrust bearing sizes |
| 9—Frame sections | 24—Tap drill sizes |
| 10—Lock washer material | 25—Vehicle horsepower formula |
| 11—Vertical carbureter flanges | 26—Electric motor voltages |
| 12—Carbureter fittings | 27—Electric vehicle ratings |
| 13—Air pump dimensions | 28—Battery appliances |
| 14—Yoke end pins | 29—Industrial trucks |
| 15—Hex spark plug shell | |

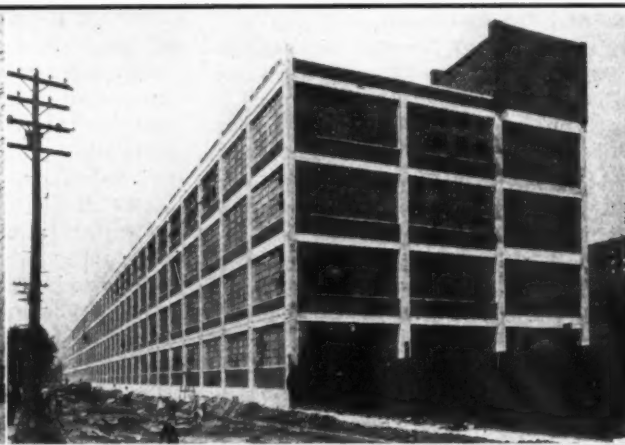
Some Building Activities During 1914—



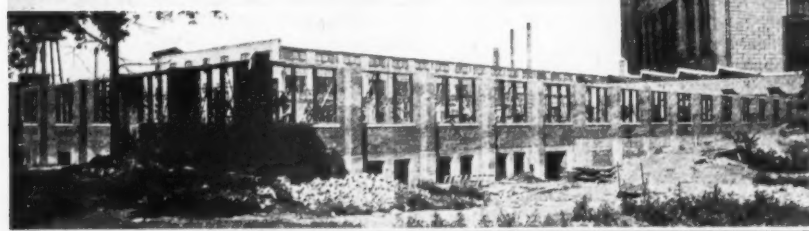
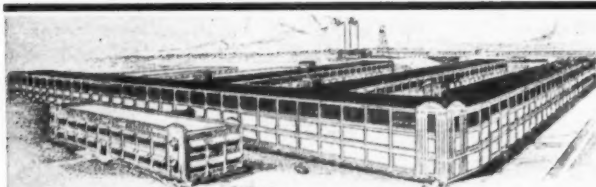
Bird's-eye view of Willlys-Overland factory at Toledo, O., showing at right new buildings erected during the year at cost of \$1,000,000. Completed structures are indicated by white lines surrounding the buildings. Other improvements under way are shown by dotted lines. The additions represent an increase in floor space of 1,985,000 square feet



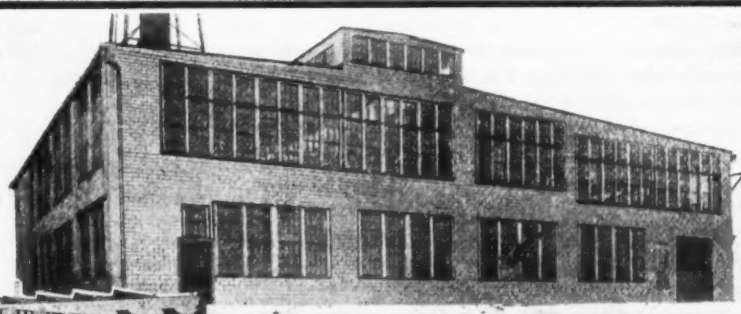
New factory occupied by the Paige-Detroit Motor Car Co. in February of this year. New machinery to the value of \$65,000 has been added for this new plant



Dodge Bros., Detroit, have increased their facilities during the year by a four-story assembly building, 876 by 70 feet, which, in addition to the other plants, gives a total area of 18.75 acres



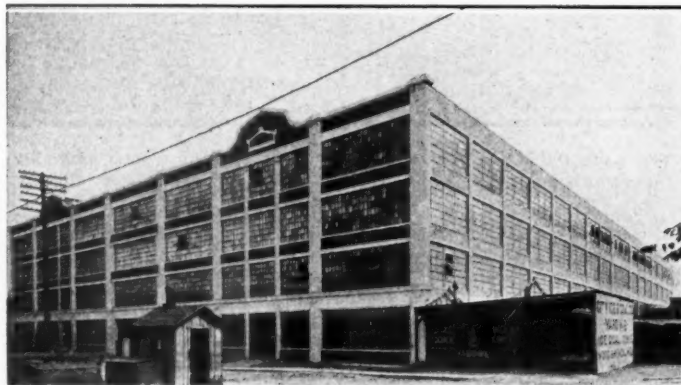
The Hudson Motor Car Co., Detroit, has increased its floor area by adding a third story to the main building (upper left) and also to three of the wings, the additions being shown in dark in the illustration



The Reo Motor Car Co., Lansing, Mich., has added 196,000 square feet. One of the new buildings (lower left) is a three-story one for various assembly departments and another is for heat-treating work. Cost of the additions was \$110,000

The Kissel Motor Car Co., Hartford, Wis., has added 60,000 square feet for foundry and body-building work (upper right) at a cost of \$60,000

Car, Truck and Accessory Plants Expand



The Cole Motor Car Co., Indianapolis, Ind., early in the year completed its new four-story factory measuring 400 by 100 feet, this new building incorporating the executive offices of the company



The Stutz Motor Car Co., Indianapolis, Ind., has occupied an entirely new factory building which increases its floor area 60,000 square feet at a cost of \$100,000

THAT business conditions are really not as bad as some people would have us believe is the only conclusion possible after a close survey of the automobile, motor truck and accessory industries, particularly in regard to the progress in increasing manufacturing facilities.

In spite of the alleged general depression, out of seventy of our leading car makers, twenty-two added to their factory area, while twenty-three increased their machinery and other equipment. The total floorspace added is over 1,125,000 square feet, the expense incurred amounting to over \$1,526,000. Machinery purchased represented an even greater expense totaling \$1,720,000.

Among thirty of the leading truck makers, seven added to their floorspace, the increase amounting to 307,320 square feet at a cost of \$72,000 and twelve bought new machinery and equipment, the total outlay being \$156,200. Two entirely new factories are reported.

Of the 150 accessory manufacturers who reported, forty-seven increased their space by a total of approximately 2,000,000 square feet at a cost of \$2,900,000. Seventy-eight of them added to their machinery and equipment, the amount invested in this direction totaling \$2,400,000. Eleven entirely new factories and one partially new one are reported.

What the Car Builders Have Done

The Auburn Automobile Co., Auburn, Ind., has expended \$10,000 in new machinery.

Consolidation of the Allen Motor Car Co., Fostoria, O., with the Sommer Motor Co., Bucyrus, O., gave an added floorspace of 40,000 square feet while test and first assembly buildings added during the year gave 35,000 square feet. New machinery, \$25,000. New buildings, \$20,000.

The Buffalo Electric Vehicle Co., Buffalo, N. Y., occupies an entirely new factory, five floors in height and 155 by 100 feet.

Cadillac Motor Car Co., Detroit, has increased its factory by 100,000 square feet. New machinery and equipment, \$600,000.

New machinery to the extent of \$42,000 has been purchased by the Chandler Motor Car Co., Cleveland, O.

The Cole Motor Car, Indianapolis, Ind., has added a four-story factory building 100 by 400 feet, which is illustrated on this page. The new building incorporates the executive offices of the company.

The quarters of the Dile Motor Car Co., Reading, Pa., has been enlarged 4000 square feet by the occupation of the new two-floor factory 60 by 150 feet. New machinery, \$5,000.

Dodge Bros., Detroit, Mich., increased facilities by a four-story assembly plant 876 by 70 feet. The total floorspace of the factory is now about 18½ acres.

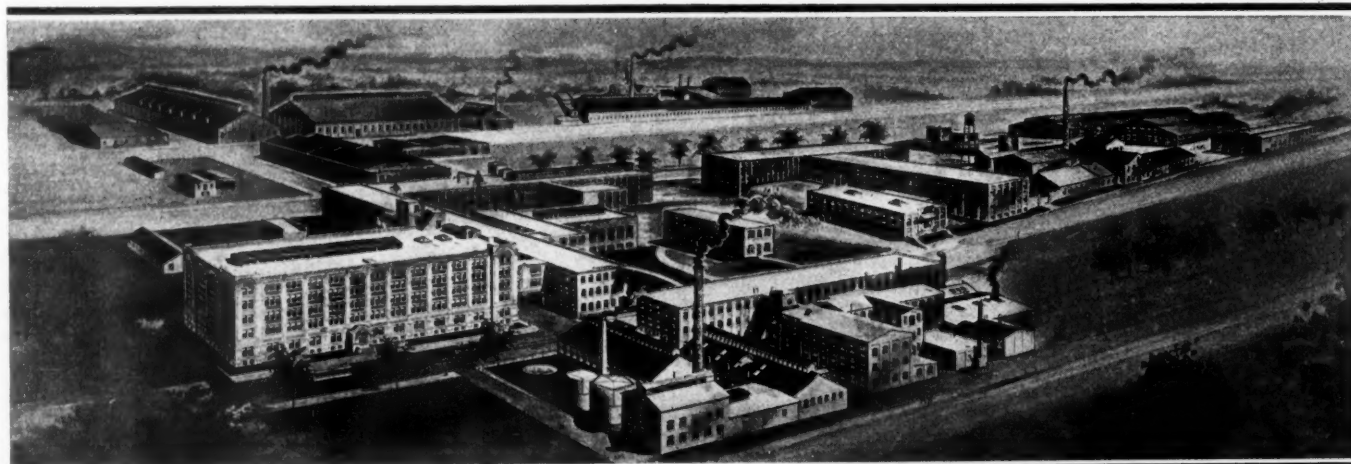
Dorris Motor Car Co., St. Louis, Mo., has spent \$5,000 in new machine equipment.

Fargo Motor Car Co., Chicago, Ill., has occupied an entirely new factory, two stories in height and 200 by 50 feet. New machinery, \$1,900.

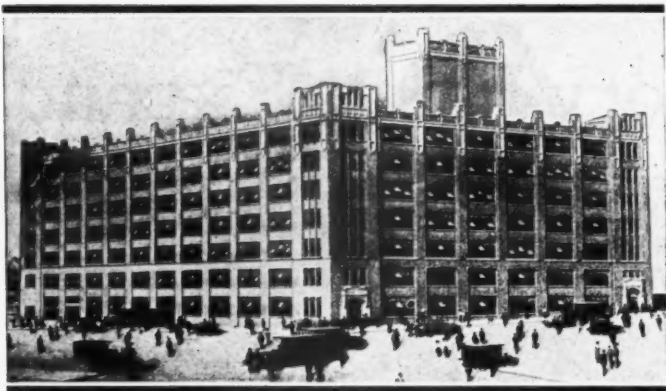
Grant Motor Car Co., Findlay, O., is established in new quarters, giving it a floorspace of 75,000 square feet.

A third story is being added to the factory of the Hudson Motor Car Co., Detroit, increasing the space from 8 to almost 11 acres. The third story is being added to the main building and three of the wings, making a total length of 2,200 by 62 feet.

The Hupp Motor Car Co., Detroit, has added an office, a dynamo-



Bird's-eye view of the combined plants of the New Departure Mfg. Co. at Bristol and Hartford, Conn. The six-story building at the left is a new \$250,000 structure occupied during the year and is one of the models in its line



New eight-story factory of the American Ever Ready Co., Long Island City, N. Y., 200 by 300 feet and representing an expenditure of \$1,000,000

meter building and a garage, 8,336 square feet, obtained at an expenditure of 6,600. New machinery, \$53,188.

Two buildings, costing \$35,000, have been added to the plant of the Kissel Motor Car Co., Hartford, Wis., giving an increase of 60,000 square feet for foundry and body building departments. About \$60,000 worth of new machinery.

Krit Motor Car Co., Detroit, Mich., has remodeled and enlarged its enameling department at an outlay of \$1,500. New machinery, \$6,000.

New machinery worth \$500 has been purchased by the Lenox Motor Car Co., Boston, Mass., during the past year.

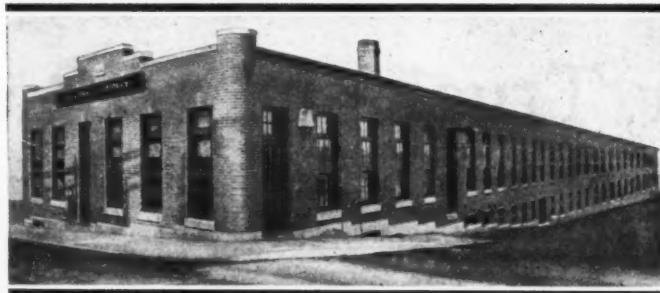
The L. P. C. Motor Co., Racine, Wis., has added 108,000 square feet. New machinery, \$60,000.

The Lyons Atlas Co., Indianapolis, Ind., has altered a great many buildings covering an area of several hundred thousand square feet at an expense of several thousand dollars.

McFarlan Motor Co., Connorsville, Ind., has remodeled its factory and added a body-building department increasing its floorspace 18,000 square feet at an expense of \$10,000.

Additions to the plant of the Metz Co., Waltham, Mass., consist of assembling, enameling, grinding, foundry and wood working departments, giving an increase of 160,000 square feet at an outlay of \$250,000. The new additions are 400 by 400 feet. New machinery, \$275.

The Milburn Wagon Co., Toledo, O., has rearranged its factory



The Auto Parts Co., Providence, R. I., by erecting a new assembly shop at a cost of \$25,000 has added 12,000 square feet of floor space

to take care of the new electric car departments, having added new offices with a floor space of 10,000 square feet.

Four buildings have been added to the plant of the Willys-Overland Co., Toledo, O., giving an increase of 1,985,000 square feet at a cost of \$1,000,000. The buildings are as follows: four stories and basement, 410 by 500 feet; two stories and basement, 400 by 200; two stories and basement, 1,000 by 200; two stories and basement, 200 by 200.

Land comprising a tract 160 by 500 feet has been purchased by the National Motor Vehicle Co., Indianapolis, Ind., for a plant site.

The new plant of the Paige-Detroit Motor Car Co., Detroit, Mich., gives the company additional floorspace of 95,000 square feet and additional quarters rented in November give 49,000 square feet for the service department. New machinery, \$65,000.

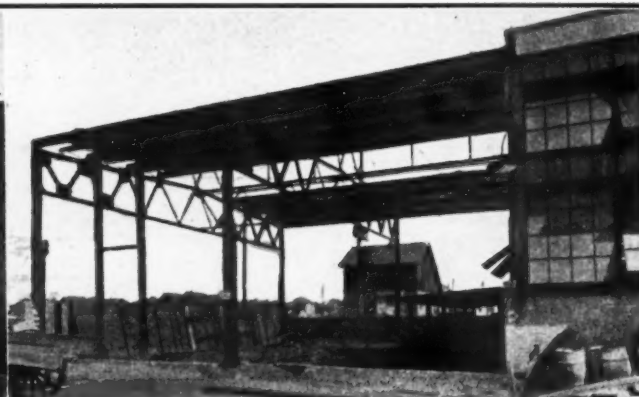
The Partin Mfg. Co., Chicago, Ill., purchased and occupied the factory formerly used by the Staver Automobile Co. in that city.

The Motor Car Mfg. Co., Indianapolis, Ind., has added 7,500 square feet.

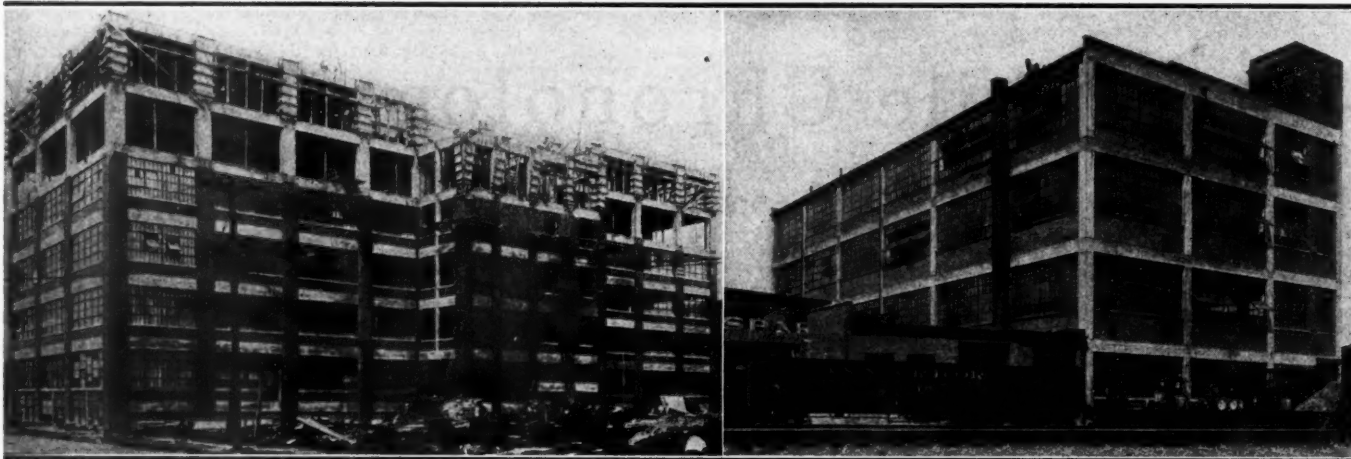
Machine tools to the extent of \$42,000 and electrical and hoisting machinery worth \$5,000 were added by the Pierce-Arrow Motor Car Co., Buffalo, New York, in 1914.

The Regal Motor Car Co., Detroit, Mich., invested \$35,000 in new machinery and equipment.

Reo Motor Car Co., Lansing, Mich., increased its floorspace 196,000 square feet. The additions represent an expenditure of \$110,000, while machinery worth \$240,000 and equipment worth \$90,000 have been purchased. One of the three new buildings is a three-story structure to house the trim, top, gear paint and various assembly departments. A general machine shop 95 by 600 feet and another structure used for heat treating complete the list.



The Continental Motor Mfg. Co., Detroit, has added 75,000 square feet of factory area at a cost of \$50,000 and has added new machinery to the value of \$150,000. The additions include a machine shop, upper left in the illustration; addition to heat-treating department, upper right; a new garage, lower left, and a new steel stamping department, lower right



The Hyatt Roller Bearing Co., Newark, N. J., has added a six-story and basement structure, 200 by 75 feet and giving an increase in floorspace of 150,000 square feet

The Champion Spark Plug Co., Toledo, O., has completed a four-story addition giving an increase of 45,000 feet at a cost of \$60,000. New machinery to the value of \$100,000 has been added

The Saxon Motor Co., Detroit, Mich., has arranged to move into the factory formerly occupied by the Abbott Motor Car Co., which, with its 135,000 square feet of floorspace will increase the space of the company 85,000 feet.

The Sphinx Motor Car Co., York, Pa., purchased the four-story factory of the Hart-Kraft Motor Car Co., dimensions being 115 by 265 feet.

The Stutz Motor Car Co., Indianapolis, Ind., has added a new building, increasing its floor space 64,000 square feet at a cost of \$100,000. The new structure is four stories, 80 by 204 feet, and will be used for assembly work. New machinery, \$1,000.

New quarters are occupied by the Twombly Car Corp., New York City. The plant comprises six buildings, the largest of which is 450 by 100 feet. New machinery, \$12,000.

An entirely new factory has been occupied by the Trumbull Motor Car Co., Bridgeport, Conn., giving the company 32,000 square feet of floorspace.

The Vulcan Car Co., Painesville, O., has added a final assembly room of 35,000 square feet at a cost of \$10,000.

The Walker Vehicle Co., Chicago, Ill., has spent \$10,000 on new machinery.

New machinery worth \$2,000 has been added by the Waverley Co., Indianapolis, Ind.

The Woods Motor Vehicle Co., Chicago, expended \$25,000 on new machinery.

In the Truck Field

The Atterbury Motor Car Co., Buffalo, N. Y., spent \$2,000 for new machinery.

New machinery worth \$3,000 has been added by the Blair Mfg. Co., Newark, O.

The Bowling Green Motor Truck Co., Bowling Green, O., expended \$1,500 on new machinery.

The Couple-Gear Freight-Wheel Co., Grand Rapids, Mich., has bought \$1,000 worth of new machinery.

The factory occupied by the new Denby Motor Truck Co., Detroit, Mich., has 20,000 square feet of floorspace.

New machinery worth \$5,000 has been added to the equipment of the Duplex Motor Car Co., Charlotte, Mich.

Factory additions totaling 6,320 square feet and respectively 40 by 40 and 59 by 80, have been made by the Four-Wheel-Drive Auto Co., Clintonville, Wis., at a cost of \$15,000. The additions will be used for power and painting departments. New machinery worth \$25,000 has been added.

At the close of 1913 the General Vehicle Co., Inc., Long Island City, N. Y., moved into its new six-story main building. Machinery, \$50,000.

The Kelly-Springfield Motor Truck Co., Springfield, O., has added two buildings, with a floor space of 26,000 square feet at a cost of \$25,000. The additions are used for assembling and machine shop work. Machinery, \$10,000.

The Knox Motors Co., Springfield, Mass., has purchased \$3,000 worth of new machinery.

One addition has been made by the H. J. Koehler S. G. Co., Newark, N. J., at an expenditure of \$20,000. It gives 4000 feet of floorspace for increasing production. Machinery, \$30,000.

The Lippard-Stewart Motor Car Co., Buffalo, N. Y., occupied an entirely new factory with a floorspace of 50,000 square feet.

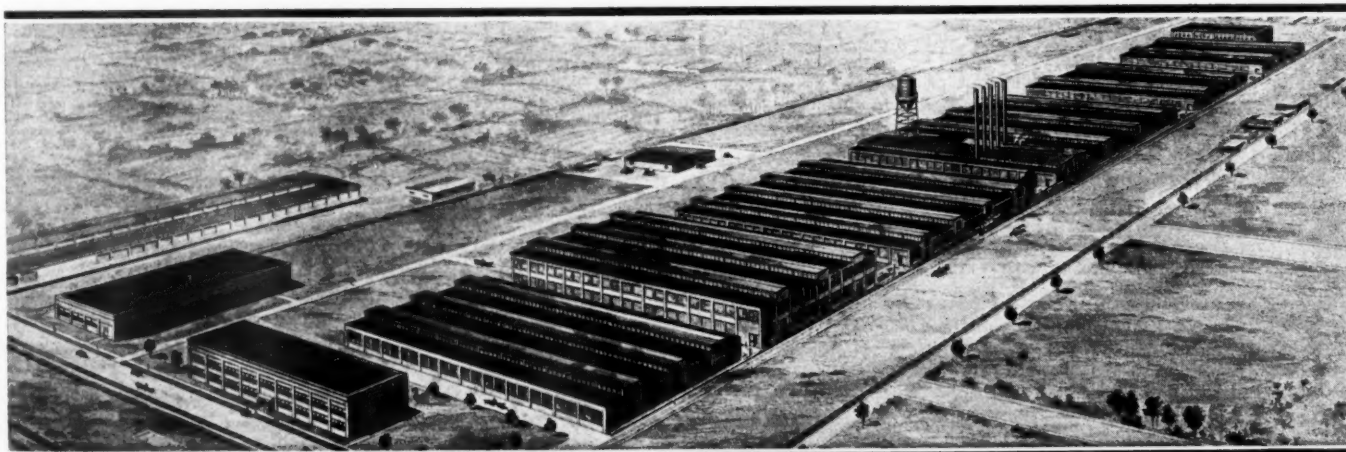
The MotoKart Co., New York City, is now erecting a plant at Scranton, Pa., which when completed will have a floor area of 195,000 square feet, comprising three manufacturing buildings, two 60 by 300 and one 60 by 250, a power building 50 by 100 and an administration building 50 by 250. Buildings will be two stories.

A one story building, 50 by 120, 6,000 square feet has been added by Nelson & Le Moon, Chicago, Ill., at an expenditure of \$12,000.

Among the Accessory Makers

With the consolidation of the Splitdorf Electrical Co., Newark, N. J., and the Apple Electric Co., Dayton, O., the Apple company arranged for the removal of its plants to Newark by the purchase of buildings giving 70,000 square feet of floorspace, 5 acres of land and an office building.

(Continued on page 1174)



Bird's-eye view of the new plant of the Willard Storage Battery Co., Cleveland, O., which, when completed, will comprise ten buildings and contain 6 acres of floor space

Automobile Chronology for 1914

Engineering

January

- 1—145 American automobile manufacturers market 1914 cars at average price of \$2,508.
- 2—American Voiturette Co. takes over manufacture of Keeton car.
- 2-10—Importers' Automobile salon, New York. Fifteen exhibitors.
- 3-10—Automobile Show, New York; 83 cars and 266 accessory exhibitors.
- 6—Moline-Knight ends 336-hour test at A. C. A., averaging 38.3 H.P.
- 6—H. M. Leland elected president S. A. E. at annual meeting.
- 6—Ford to distribute \$10,000,000 among employees on profit-sharing basis.
- 15—Benz makes 122 m.p.h. at Brooklands. Hornsted's driving beats Demogeot's record at Ormond, by making 2 miles in 0:57.99, Demogeot's record being 0:58 2-5.
- 15—Buick six goes 20.1 m.p.g. at Chicago. Large and small four-cylinder models make 22.5 and 17.9 m.p.g. respectively.
- 20—Safety First Society organized.
- 21—American Electric Car Co., \$1,500,000 capital, organized in Chicago to take over Argo, Brock and Borland-Grannis companies.
- 22—85,000 commercial vehicles in use in U. S. with 274 makers.
- 24-31—Chicago Automobile Show; 87 cars and 266 accessory exhibitors.
- 26—National Automobile Chamber of Commerce, Inc., christened.
- 27—Nobby Tread patent declared void. Court decides that knobby tread does not infringe Stafford.
- 27—Cyclecar Manufacturers' National Assn. formed at Chicago.

February

- 10—Exports for 1913, \$27,029,451; 25,880 passenger cars and 1,009 trucks; \$3,325,462 over 1912.
- 10—Russell-Knight motor averages 35.6 H.P. in 300-hour test at Toronto.
- 13—Paige-Detroit M. C. Co. moves into new factory.
- 16—Mitchell sells wagon business. Adds \$2,700,000 to automobile capital.
- 21—Splittorf Electrical Co. takes over control of Apple Electric Co.
- 28—Pullen wins Grand Prix in Mercer, 77.2 m.p.h., 403 miles.
- 29—De Palma wins Vanderbilt in Mercedes, 75.5 m.p.h., 295 miles.
- 29—Detroit builds 35,900 cars in February. A new record.

March

- 2—Supreme Court decides that makers cannot fix retail prices.
- 3—Argo Motor Co., Inc., to build \$295 car.
- 3—Palmer & Singer Mfg. Co. files petition in bankruptcy.
- 7-14—Boston automobile show opens with 90 car exhibitors.
- 9—Kardo Co. organized for patent purposes, \$1,000,000 capital.
- 10—U. S. has 1,253,875 registered cars, an increase of 243,392 over 1912.
- 18—F. P. Porter leaves Mercer to build own car.
- 18—Singer Motor Co. organized with \$175,000 capital.
- 19—George Westinghouse dead.
- 26—E. Y. Knight patents double-sleeve motor.

April

- 9—J. Ellwood Lee, of Lee Tire & Rubber Co., dead.
- 12—Entz Corp., \$3,000,000, to build cars with electric transmission.
- 15—Prest-O-Lite wins against Searchlight at Chicago.
- 22—Ford production nears 600,000 cars since inception.

Industrial

May

- 1—Ninety-four Franklin cars average 32.8 m.p.g. in nation-wide competition. High mileage is 51.2 m.p.g.
- 2—Chandler Six does 24.4 m.p.g. at Chicago.
- 5—Ten patents assigned to Universal Rim Co., Chicago.
- 5—E. P. Batzell, Hudson engineer, dead.
- 9—Charter for new Knox company given Mayo heirs. Knox Motors Co., Springfield, Mass., incorporated for \$2,500,000.
- 12—42.4 m.p.g. on French car trials; 18 light cars show economy in 2,000-mile test.
- 13—Chandler Six makes 23.7 m.p.g. in New York City.
- 16—180 Saxons average 34.75 m.p.g. in fuel test.
- 18—Stewart-Warner enjoined on Motometer patent.
- 19—G. A. Matthews, president Jackson Co., dead.
- 19—Ford declares \$2,000,000 dividend.
- 25—Bailey electric averages 22.8 m.p.h. in Boston-New York run.
- 26—American Electric Starter Co., Detroit, absorbs Disco.
- 30—Thomas in Delage wins 500-mile race, Indianapolis, 82.47 m.p.h.

June

- 4—Col. Charles Clifton re-elected president N. A. C. C., Inc.
- 5—Steinmetz declares 1,000,000 light battery-driven vehicles costing under \$500 will swarm streets.
- 11—Sunbeam wins Isle of Man race, 56.44 m.p.h. in 600-mile 2-day race.
- 15—Cyclecar taxicabs planned by \$500,000 Twombly Co., fixing 25-cent cost for first mile.
- 19—Carnation 24-hour non-stop run 29 m.p.g. in New York City.
- 20—Packard touring car averages 75 m.p.h. at Indianapolis Speedway for 1 hour.
- 20—1913 tire exports total \$3,943,220.
- 23-26—S. A. E. opens eighth summer session at Cape May, N. J.
- 24—Michigan has 89,413 men employed in automobile industry.
- 23—Thomas H. White, founder White Co., dead.
- 27—Master Carburetor Corp. formed, capital \$250,000.
- 29—Chevrolet Co. buys old Maxwell-Briscoe factory, Tarrytown, N. Y.
- 30—Moline Automobile Co. to build Knight motors for trade.

July

- 3—150,000 more cars registered in first 6 months of 1914 than same period in 1913; 1,203,770 cars, 33 states.
- 4—Stutz wins 250-mile race, Tacoma, 73.44 m.p.h. Maxwell wins 200-mile event, 74.28 m.p.h.
- 4—Lautenschlager in Mercedes wins French Grand Prix, 65.55 m.p.h. Mercedes cars take next two places. Distance, 467.5 miles.
- 4—Rickenbacher in Duesenberg wins 300-mile race, Sioux City speedway, 78.6 m.p.h.
- 5—Studebaker six averages 15.15 m.p.g. in series of five 200-mile events.
- 6—3,732,585 sq. ft. in Ford plant after expansion of 10 years.
- 7—Transcontinental Saxon reaches San Francisco. Averages 30 m.p.g. for 3,389 miles.
- 8—Dodge Bros., Inc., \$5,000,000, Detroit, Mich.
- 8—Franklin shows 84.4 per cent. efficiency in test at Worcester Polytechnic Institute.
- 8—E. C. Patterson in Packard six makes Chicago-New York run in 41 hours.
- 11—Denby Motor Truck Co., Detroit, Mich., organized.

General

- 18—Detroit's car and truck exports in 6 months \$3,154,875.
- 18—Stearns company adds 500,000 square feet to factory.
- 25—Grand Prix Peugeot with 274.6 cu. in. piston displacement makes 107 m.p.h. over 4.3-mile straightaway at Boulogne.
- 30—United States has 1,548,350 cars registered in first 6 months of 1914. A gain of 294,485 over same period for 1913.
- 30—239,902 cars from 25 Detroit plants in 6 months. Ford production 162,000.

August

- 1—Ford profit sharing plan lowers car prices \$60.
- 10—Winton Motor Car Co. new name for Winton Motor Carriage Co.
- 11—New York Division of Electric Vehicle Assn. formed.
- 12—Disbrow in Simplex lowers 2-mile track record at St. Louis, 1:32 3-5.
- 12—Tetzlaff's Benz goes 1-2 mile in 12 3-5 seconds at Salt Lake City salt beds.
- 13—Michigan motor industry supports 22 per cent. of state's population.
- 13—Tire companies increase prices from 12 1-2 to 20 per cent.
- 13—Crude rubber raises from \$0.70 to \$1.15 in 1 week.
- 15—Record exports last fiscal year; 30,136 valued at \$27,797,642 and \$4,159,454 in tires.
- 17—Apple Electric Company moved to Newark, N. J.
- 22—Wood-wire wheel test by Automobile Club of America finished.
- 24—De Palma in Mercedes wins both Elgin races; 73.53 m.p.h. for 301 miles in Elgin National Trophy and 73.91 m.p.h., 301 miles, in Chicago Automobile Club cup.
- 30—One hundred and twenty-seven Detroit companies incorporated in 7 months.

September

- 1—Europe orders 1,000 motor trucks.
- 1—Used-car markets—Chicago Auto Trade Assn. publishes first market report.
- 1—Receiver for American Voiturette Co., Detroit.
- 3—Chevrolet Royal Mail roadster makes 27.9 m.p.g. in New York City.
- 3—Tire prices down to normal.
- 11—Buick wins Wisconsin 500-mile reliability.
- 12—Burman sets world's 15-mile record in 12:47, Peoria, Ill., in Peugeot.
- 12—Sphinx M. C. Co. buys Hart-Kraft factory.
- 15—Remington Motor Co. announces \$495 car.
- 17—Cadillac announces eight-cylinder motor.
- 19—General Motors annual report shows \$85,373,303 gross sales.
- 25—Champion and Jeffery-Dewitt spark plug consolidate.
- 26—One hundred and sixteen Franklin sixes average 11 m.p.h. on low gear for 100 miles.
- 28—Chandler company declares extra 10 per cent. dividend.
- 29—Ford lists chassis at \$410.

October

- 1—Stearns-Knight four for \$1,750.
- 6—New York separator repeal law defeated.
- 7—Horsepower and gasoline war tax defeated by Senate caucus.
- 7—Hess-Bright wins bearing suit.
- 7, 8, 9—Motor Truck Club of America holds 4-day convention at Detroit.
- 9—Cole four averages over 22 m.p.g. in Indianapolis speedway tests.
- 12—W. H. Van Devoort nominated S. A. E. president.

- 12—Five hundred and forty-eight companies allotted space for National shows.
- 12—Maxwell earns 12 per cent. on first preferred stock. Net earnings \$1,430,444.52.
- 15—Packard production passes 25,000 mark; 3,612 vehicles built in company's fiscal year.
- 19—Receiver for Premier Motor Mfg. Co.
- 19-20-21—Electric vehicle annual convention at Philadelphia.
- 23—Burman in Peugeot breaks 75-mile dirt track record, 1:08:56, Galesburg, Ill.
- 24—Alley in Duesenberg breaks 100-mile dirt track record, at Hamline, Minn., 1:31:30, over 65 m.p.h.
- 26—King has eight-cylinder car at \$1,350.
- 27—Ray Harroun appointed chief engineer Maxwell company.
- 27—Owen to develop Weidely motor. Weidely Motor Co. organized.
- 27—Stromberg-equipped Jeffery makes 28.7 m.p.g. at Chicago.
- 29—United States has 1,735,369 cars registered to October 1. Gain of 203,503 over statistics July 1.

November

- 2—Canadian-American firms to make 36,000 cars in 1915.
- 5—Handley buys Marion; to reorganize company. Assets bring \$120,000.

- 7—Two-mile speedway for Minneapolis and St. Paul. Twin City Speedway Assn. builder.
- 9—Pope-Hartford, with Hugh Miller and Ed. Orr driving, breaks El Paso-Phoenix record; 533 miles in 14:37, at 50 m.p.h.
- 9—Overland, Stromberg-equipped, makes 29 m.p.g.
- 9-14—Fourth American Road Congress, Atlanta, Ga.
- 10—Finley R. Porter announces F. R. P. chassis at \$5,000.
- 10—Dodge \$785 car out.
- 11—Grant six with electric system, \$795.
- 11—Oldfield in Stutz wins Los Angeles-Phoenix desert race, 696 miles.
- 12—Marmon 41 averages 62.89 m.p.h. for 1 hour with five passengers and top up, Indianapolis speedway.
- 13—Ford increases surplus by \$20,702,859.39. Total surplus, \$48,827,032.07.
- 20—English government places embargo on rubber shipments from Far East to U. S. in English boats.
- 20—Up-river Para down to 64c. a pound.
- 23—Monroe two-passenger car, \$460.
- 23—Chicago Stock Exchange resumes trading. Closed since July 30.
- 23—France buys 900 motor trucks.
- 26—Pullen wins Corona race at 87.7 m.p.h., 302 miles, world's record.

- 29—Saxon Motor Co., Detroit, leases Abbott Motor Co.'s factory.

December

- 1—England orders 250 Peerless trucks.
- 1—Saxon six, \$785.
- 4—War tax of 10 cents for car owners in several states.
- 5—N. A. C. C. starts interchange of patent licenses by makers.
- 8—Overman Cushion Tire Co., New York City, with \$150,000 capital, organized to succeed bankrupt Overman Tire Co.
- 8—Cincinnati court rules against Ford to maintain fixed retail prices.
- 9—Lozier Motor Co. declared bankrupt.
- 10—October exports, \$3,055,351; trucks exports, 672. Gain, 593.
- 10—Five-passenger Reo six for \$1,385.
- 12—New York Stock Exchange opens. Closed July 30.
- 12—N. A. C. C. co-operates with spring makers to stop truck overloading.
- 14—Metz touring car at \$600.
- 14—American Motors Co., Indianapolis, discharged from bankruptcy.
- 14—Walker Vehicle Co. absorbs Chicago electric.
- 15—Frank E. Smith, receiver, Premier Motor Mfg. Co., to continue manufacture.
- 15—Chicago to have 2-mile board speedway.

Recent Court Decisions—Guest Sues Owner

By George F. Kaiser

A MOTORIST must use care to prevent a guest whom he has invited out riding from being injured, and if a guest is injured he may bring suit against the motor car owner.

A motor car owner invited a friend to go riding with him. While they were on the trip the owner drove negligently and the car hit a telephone pole and was over turned. The guest had an arm broken, his shoulder, elbow and left ankle sprained and his head cut, and also suffered severe bruises all over his body. He sued his friend the car owner for his injuries and the Court decided that the suit was proper, even though the owner was insured by a liability company and judgment was rendered in favor of the injured party for \$1,750.—*Fitzgerald vs. Boyd*, 91 Atlantic (Maryland) 547.

Watch Your Policy

Texas Court decides that, even though a man broke the warranties in an automobile fire insurance policy, he may still recover, when the company's general agent waived the breach.

A motorist had a \$4,000 fire insurance policy on his car, which was destroyed by fire. He brought suit against the insurance company to recover that amount. The company claimed that he had broken his policy so that at the time of the fire it was null and void. The policy provided that "It is warranted by the insured that the automobile hereby insured, during the term of this policy, shall not be used for carrying passengers for a compensation, and that it shall not be rented or leased." . . . "In the event of violation of any warranty hereunder, this policy shall immediately become null and void."

During a fair at Dallas, Tex., the motorist's son took the car, without his knowledge or consent, and used it for carrying passengers to and from the fair grounds for hire.

Although the company contended that this made the policy null and void, the Court said that it did not believe that the use of the car that way for a limited time breached the policy, as the working evidently meant that it should not be used that way continuously.

The company further contended that, as the policy contained the clause that "in consideration of the reduced rate at which this policy is written, it is understood that the property insured hereunder shall, at all times, be kept or

stored in the private garage or private stable situate at 1000 South Harwood street, Dallas, Tex.; privileged, however, to operate the car and to house in any other building or buildings for a period of not exceeding 15 days at any one location, at any one time, provided the car is en route, visiting or being cleaned or repaired. All other terms and conditions of the policy remaining unchanged," and the motorist had used the car for several trips lasting more than 15 days, the policy was also null and void under this warranty.

The Court decided that, notwithstanding the fact that the policy was broken, the motorist was entitled to his insurance, because he had gone to the general agent of the company and had asked permission to go to his farm and such permission had been given him.—*Commercial Union Assurance Co. of London vs. Hill*, 167 S. W. (Texas) 1095.

Motorist Loses in Damage Suit

The fact that a motorist failed to give proof of his competency as a driver, and to show within what distance his car could be stopped, together with his failure to produce the bicyclist, who was an eye witness to the accident, caused the Minnesota Court to hold that judgment against him was proper, in a late case where a horse owner sued for injuries to the horse.

A horse was tied to a hitching post on a curb of a street in St. Paul. A few feet away, and on the other side of the street, was a covered automobile. The owner of the horse was absent 15 minutes and, on returning, found that the horse was so badly injured that he had to be killed. The owner of the horse thereupon sued the owner of the automobile for the value of the horse. The motorist showed that he had driven near the center of the street at about 10 to 12 miles an hour, and that when he was about 7 or 8 feet from the horse, a bicycle suddenly came from behind the carriage and, to avoid running down the bicyclist, he turned his machine at right angles and applied his brakes and that the pavement being wet, the machine skidded, hit the horse and injured it.

The court decided that he should have gone further and showed how competent he was to operate the machine, within what distance it could be stopped and should have either had the bicyclist in court as a witness or explained his absence.—*Whitewell vs. Wolf*, 149 N. W. (Minnesota) 299.

Balanced Intake in Rotary Motor

Bournonville Single Rotary Sleeve Performs Functions of Exhaust and Inlet Valve—Operated for 4,000 Miles

EUGENE M. BOURNONVILLE, who was one of the pioneers in oxy-acetylene welding in America, has invented a rotary valve engine and placed it in a chassis and after having submitted it to a 4,000 mile test is now making negotiations for its sale. As in other rotary valve motors which have recently been placed on the market, there is no difference from ordinary engine construction. In making up the experimental job a Fiat power plant was used, the only alteration being in the top of the cylinder head. Here a rotary cylinder extends horizontally the length of the motor and performs the functions of the inlet and exhaust valves.

A housing above the cylinder head contains the rotating cylindrical valve, and it is in the arrangement of the gas passages in the housing and in the valve itself that Mr. Bournonville claims to have overcome the difficulties which have heretofore been found in rotary valve motors.

Referring to Fig. 1 the top of the cylinder is seen at A and a passage or port leads from it vertically upward at B. This port serves as the means of communication between the valve above it and the cylinder below and hence offers a common passage for the exhaust and inlet gases. The valve itself is denoted by C. It rotates in the housing D. The intake manifold is a unit with the housing at E and the exhaust port is at F leads into the manifold G. This entire assembly is surrounded by the waterjacket H.

Referring to the transverse section of the motor at Fig. 1. the inlet manifold E runs the entire length of the motor and communicates through the ports L to the corresponding openings in the valve over each cylinder. In the position shown the cylinder is receiving its charge under suction stroke, the gas entering at L passing through M and thence through the opening B into the cylinder. As the valve turns on its axis the port is closed by the solid portion N covering the opening B. This holds the compression and after the firing stroke covers the inlet port L while the next opening portion of the valve O affords a passage from the cylinder through B to the exhaust manifold G. The positions of the valve for inlet, compression, firing and exhaust are given in Fig. 5.

Thus far the action of the valve is similar to other rotary valves. The big difference is in the means of distributing the

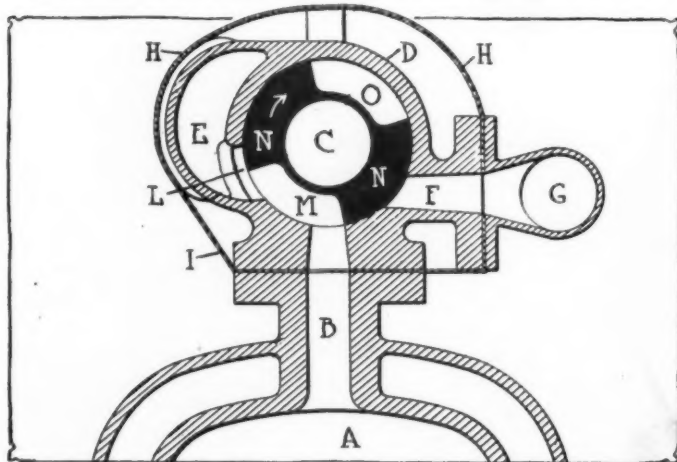


Fig. 1—Transverse section through Bournonville rotary valve motor

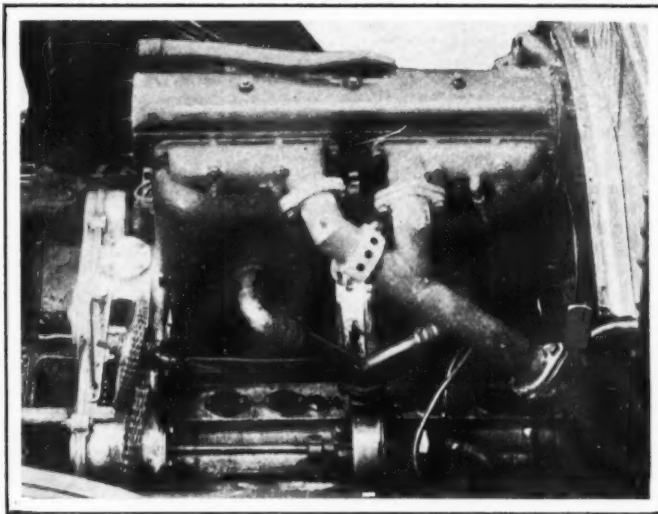


Fig. 2—Exhaust side of engine, showing mounting of valve housing

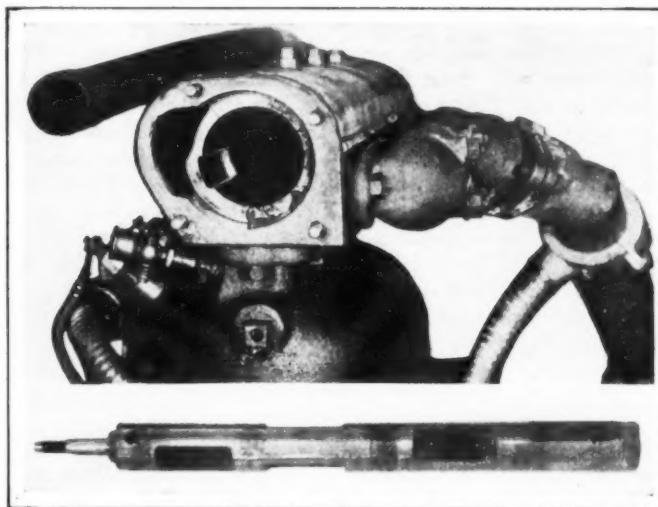


Fig. 3—Mounting of the valve housing and, below, the valve withdrawn

intake charge. The arrangement is such as to provide a heat balance and a friction balance at each cylinder, thus securing uniformity in the performance. The inlet manifold E extends the entire length of the valve housing passage. It communicates with the port L, which also extends the entire length of the housing, at each end. This offers, in effect, a long tube open at either end with gases entering from both sides. At four points in the length of this pipe there are openings corresponding to the passages to each of the four cylinders. Since the gases enter from the two sides simultaneously the average temperature of the gas will be the same at each cylinder because, if the gas gained one heat unit for each unit of length traveled and it had to travel two units from one side and eight units from the other it would have gained ten units; or, if it had to travel five units from each end it would still have gained ten heat units. This holds true for any point from which the gas is taken, in the length of the pipe. A friction balance is maintained in the same way. The distance that the gas has to travel is always the same no matter for what cylinder and hence the amount of frictional resistance to be overcome is constant.

Another effect secured by having the intake passage L

open at both ends is that the gas is continually see-sawing backward and forward, giving a wiping action of the gases on the exposed surface of the rotary valve. This action is what the inventor claims to be the agent which keeps the valve free from carbon and hence eliminates cutting. On the engine which has now run 4,000 miles there is no sign of cutting visible. There is no carbon deposit on the exterior surface of the valve although in the ports *M* and *O*, there is the same kind of carbon caking that would be noted in the ports of a poppet valve motor. These ports, which are dark on account of the carbon deposit, can be seen in the accompanying illustration Fig. 3 and it will be also noted that the bearing surface of the valve retains its polish. A method of driving this valve is shown in Fig. 6. It is by silent chain from the crankshaft through the reduction gear as shown. The timing gear case in the illustration is not required in the rotary valve motor but remains in its position through the fact that this is a rebuilt job. In the tests that were carried out the old camshaft was left in place although turning idly.

With the two ports *M* and *O* the rotary valve is driven at one-fourth crankshaft speed. If it is desired the number of these could be increased to three or four with consequent reductions in the speed of the drive. This would not be feasible on smaller motors. The dimensions of the test motor illustrated are 4 15-16 by 5 15-16.

Valve Timing Orthodox

The timing of the rotary valve does not differ materially from that of ordinary poppet practice. The intake opens 15 degrees after upper dead center and closes 20 degrees after lower dead center. The exhaust valve opens at 45 degrees before lower dead center and closes 5 degrees past upper dead center. This gives a 10 degree pause between the exhaust closing and the intake opening with which a vacuum is created in the cylinder to promote a rapid inflow of gas on opening. The area of the ports is the same for intake and exhaust being 2.25 square inches with a length of 4.5 inches and width of .5 inches. Compression is 72 pounds per square inch.

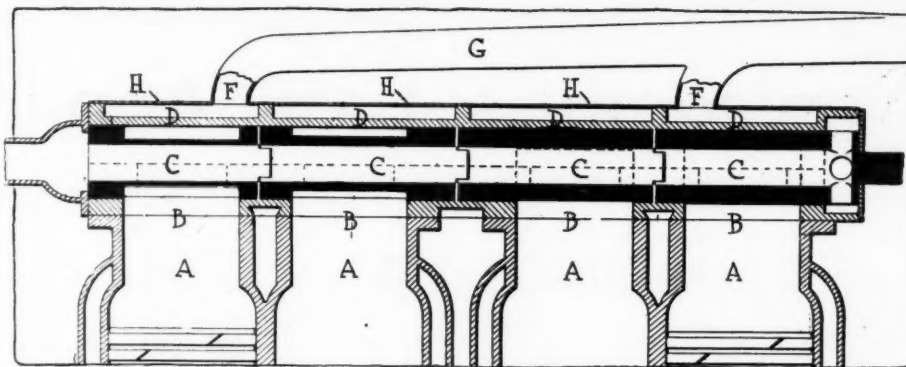


Fig. 4—Longitudinal section through Bournonville motor, showing valve in four parts

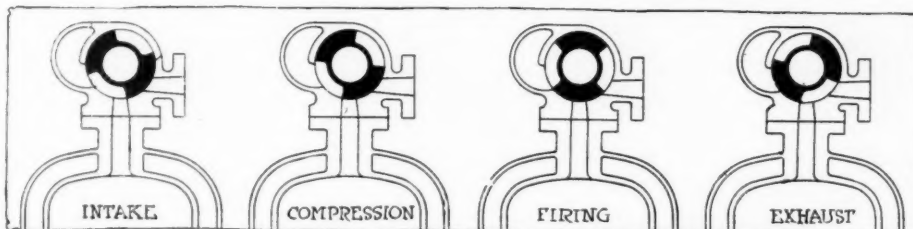


Fig. 5—Positions of the rotary valve for intake, compression, firing and exhaust

In manufacture the cylindrical valve is made with .002 inch clearance in its housing. The housing itself being of large diameter can be ground with a cylinder grinder and the sealing of the valve is accomplished by the oil film in the small amount of clearance. The oil itself is the thinnest possible to avoid the loss of power required through shearing a heavy oil film. In taking down the engine after a difficult 100-mile run during which the car was driven by a representative of THE AUTOMOBILE a liberal coating of oil was found along the entire surface of the valve. Oiling on the experimental engine insofar as the cylindrical valve is concerned is taken care of by the suction of the cylinder. It is purposed on the permanent job to install a mechanical oiler. Another important feature which will be changed in the permanent manufacturing job is in the making of the valve housing and waterjacketing integral with the cylinder casting. This will reduce height and permit of more advantageous jacketing.

The elimination of moving parts is the chief advantage claimed. The valve timing once set remains constant and the valve itself can be taken out for examination in 10 minutes. As the valve is made in four parts as shown in Fig. 2 the amount of warping for each part should not be of any effect.

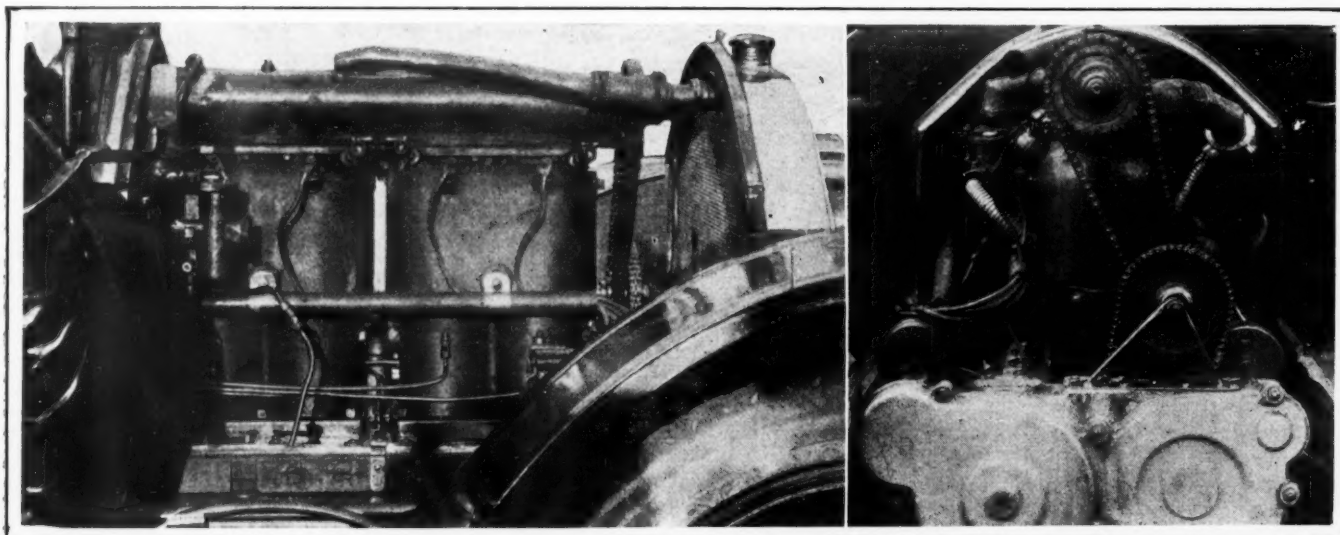


Fig. 6—Side view of Bournonville motor installed in Fiat chassis—Arrangement of chain valve drive on experimental job

Newcombe's Law Applied to Motors

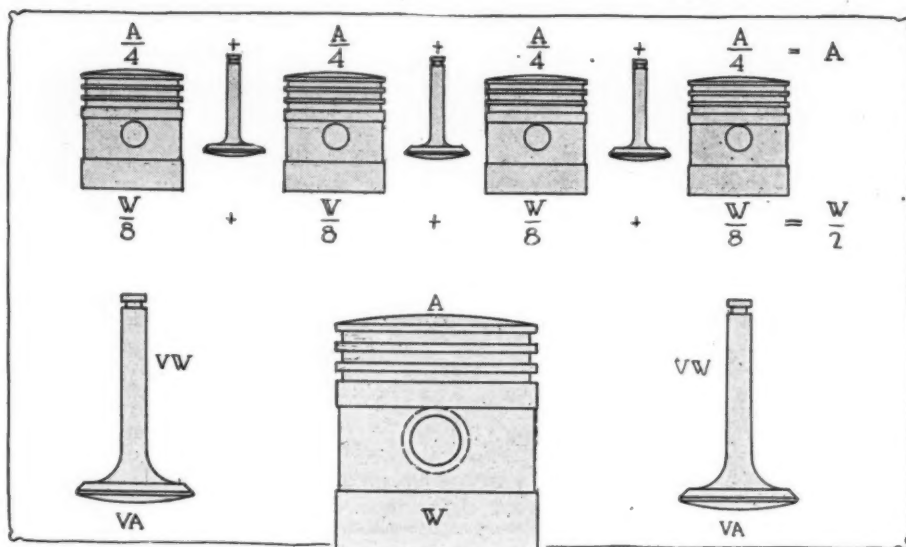


Fig. 1—Illustrating Newcombe's law. Above—Four pistons each half the size of the large piston shown below or 3 inches in diameter. This shows how by decreasing size an equal piston area is obtained while the reciprocating weight is thereby cut exactly in half. Below 3 inches mechanical difficulties limit carrying the law to the extreme

Piston Friction
in
Multiple-Cylinder
Types
Compared—
Rigidity a Factor
in
Longevity

By William B. Stout

Chief Engineer, The Scripps-Booth Co.

DETROIT, MICH.—Editor THE AUTOMOBILE:—The high-speed motor is a coming proposition. Slow-speed motors have proved grossly inefficient compared with the small-bore, high-speed types of Europe.

A high-speed motor may be as long lived as a slow speed. The four-cylinder motor in racing has proved the best high-speed automobile motor to date. The new eight-cylinder type of motor is acclaimed with reason as a better high-speed possibility than are six-cylinder constructions.

Rigidity a Necessity

Rigidity is the basis of engineering construction in high-speed motor design. Balance is the secret of power and r. p. m., and the chief reason for the long life of high-speed motors. Small bore and light pistons are, in turn, a chief secret of balance and form the primary basis for the very high degree of efficiency which is obtained in motors of high-speed type.

It is no longer good engineering, or good sense to judge the power of a motor by its bore and stroke. A 2 1/2 by 4-inch motor may give 6 horsepower actual or it may give 18 horsepower. R. p. m. with bore and stroke is not an entire basis of judgment. A motor may be able to turn up to 3,200 r. p. m. on the block and yet its power curve may show a decided drop in power at 1,000 r. p. m.

Efficiency the Aim

The chief aim of the high-speed motor is efficiency. If one takes a 12-horse-

power motor and runs it at twice the speed with the same efficiency he will get 25 horsepower from the same bore and stroke. The aim of the up-to-date, high-speed motor designer, then, is to obtain the same efficiency, long life and freedom from vibration at 2,500 r. p. m. that present motors show at 1,200.

Every indication points toward the high-speed motor as the real innovation of 1915, public interest toward this type of motor having begun with the success of the Peugeot in the Indianapolis race in 1913.

With the coming of the eight-cylinder motor as a large probability for 1915, interest in high speed types has been doubled, as the eight-cylinder has possibilities as a high-speed, long-life motor.

Six Speed Limited

The six cannot attain to real high speed, due to crankshaft limitations.

A high-speed motor can be made as long lived as a slow-speed motor and can be run with as little overhauling and expense. The matters of long life and small wear are almost entirely questions of the rigidity of parts rather than their mere capability of transmitting the amount of power which goes out of the motor. Shaft diameter, for example, is figured largely, not from its power-transmitting capabilities, but its stability and freedom from whipping at the r. p. m. for which it is intended. Motors whose power could be transmitted by a 1-inch shaft are fitted with crankshafts over 2 inches in diameter and of the highest grade steels. Crankcases are stiffened. Castings throughout are watched to prevent internal vibration in the motor, which will tend to misalignment of bearings or distortion-friction in any of the moving parts. These conclusions point toward the eight V-type

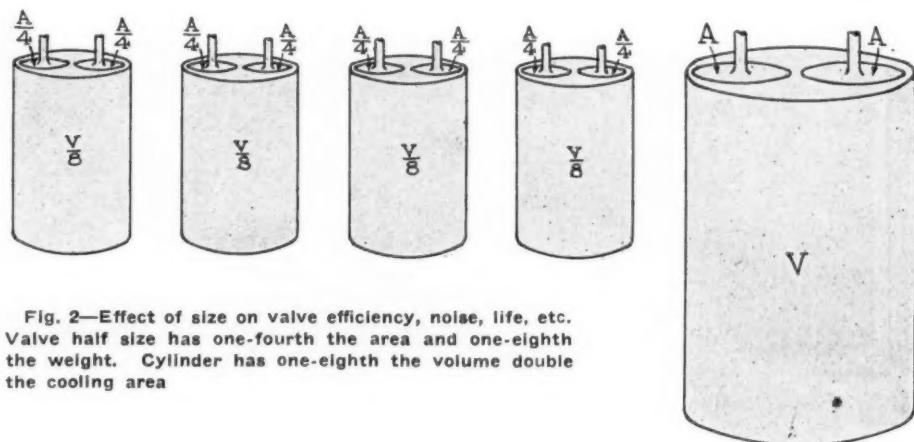


Fig. 2—Effect of size on valve efficiency, noise, life, etc. Valve half size has one-fourth the area and one-eighth the weight. Cylinder has one-eighth the volume double the cooling area

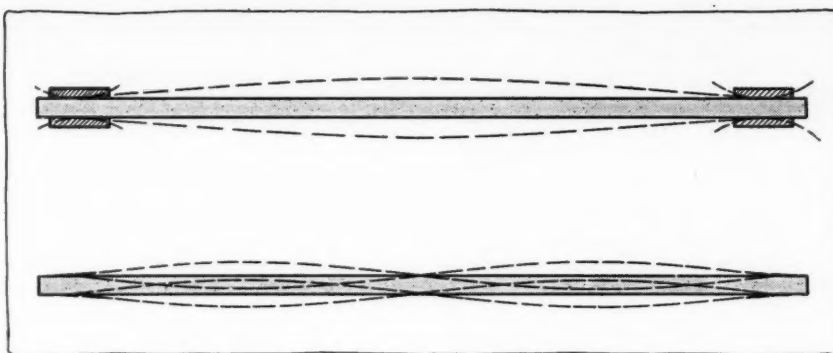
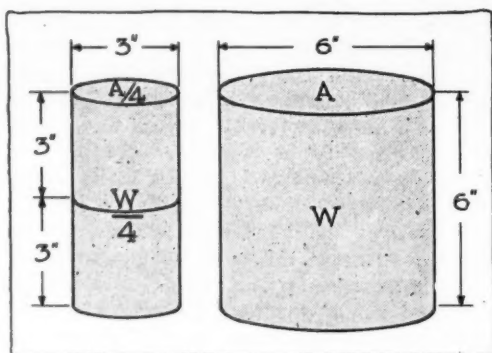


Fig. 3—Left—Theory of 2 to 1 stroke ratio. Fig. 4—Right—Above—Critical speed in shafts, the limitation of most American cars, the basis of metal fatigue. Below—Second critical speed with center node

motor as the eventual motor for cars requiring above 3-inch bore.

It would be practically impossible to build a high-speed six, in the writer's opinion, of greater than 3-inch bore, and even then the question would be one of the length of life of crankshaft bearings. A two-bearing crankshaft is preferable for high-speed work, from the standpoint of manufacturing cheapness, for a three-bearing shaft needs to have each web counterbalanced, and again because this type of motor is shorter and lighter in weight. The large size of the crankshaft insures the rigidity.

If a crankshaft of certain size is rigid on a four-cylinder it is doubly rigid if applied to an eight of equal cylinder capacity, for each explosion is of smaller moment, and the reciprocating parts are very much lighter in the eight. This statement holds good for all motors above a bore in the neighborhood of 3 1-2 inches. In smaller sizes, mechanical limitations do not allow the same laws to hold.

The smaller the bore, the more feasible, commercially, becomes the overhead valve. For really high-speed work where greatest amount of efficiency from bore and stroke is aimed at, overhead valves are a necessity. These valves as constructed in modern small bore motors, are even quieter than L head motors of the larger type and are especially accessible.

The following discussion covers points governing the main constructional ideas of high-speed motor construction:

Thinks 3-Inch Ideal

There is a basic engineering law which points toward the small-bore motor as an eventual type for all internal combustion engines where weight is a factor. Maximum and minimum formulas show that the most efficient motors, all things considered, probably will have a bore of around 3 inches.

All arguments to date in favor of six and eight-cylinder constructions have been based on purely theoretical assumptions, but few have taken into consideration the mechanical difficulties and limitations which hedge any theory in

its application to automobile motor practice. There are certain things which are as basic in their application and as inevitable in their result as the fact that two plus two make four. The law governing motor size and pointing toward future development is as basic as this and was seriously brought to public notice by Simon Newcombe in his now famous mathematical proof that aeroplanes would never fly. The law which he stated exists, but the aeroplane designer, approaching the flying machine from a different angle than what Newcombe had in mind, overcame the law by mechanical construction which made it an assistance instead of a detriment.

Newcombe's Law

Briefly stated and explained, the law is this: IF YOU MAKE A THING HALF THE SIZE IT HAS ONE-FOURTH THE SURFACE, BUT ONE-EIGHTH OF THE WEIGHT.

ALL SURFACES ARE MEASURED BY TWO DIMENSIONS, LENGTH AND BREADTH; VOLUMES ARE MEASURED BY THREE DIMENSIONS, LENGTH, BREADTH, AND THICKNESS. IF YOU DECREASE AREA ONE-HALF YOU DECREASE TWO DIMENSIONS AND THE SIZE IS ONE-FOURTH. IF YOU DECREASE VOLUME ONE-HALF YOU

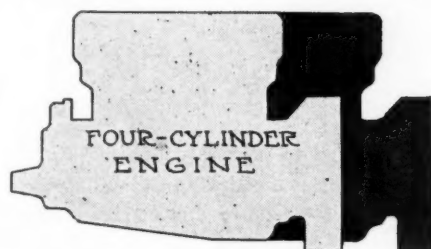


Fig. 5—Diagram showing the added weight in six-cylinder motor construction

DECREASE THREE DIMENSIONS AND THE MASS OR WEIGHT IS ONE-EIGHTH. THIS BRIEFLY EXPLAINS WHY HIGH-SPEED MOTORS ARE DOING SUCH REMARKABLE WORK AND AT THE SAME TIME SHOWING SUCH SURPRISINGLY LONG LIFE.

Fig. 1 shows this law as applied to piston size, for example.

Below is shown the piston of a large bore motor—say 6 inches. This has an area on top of A, it has a weight together represented by W. The power of the motor is determined by three factors: the area A, length of the stroke L, and the r. p. m., R. It will be shown that the size of the piston has a great influence on all three of these factors and that the smaller the piston—within mechanical limitations—the more efficient.

Applying the Law

Above are shown four pistons, each half the size of the big piston, or 3 inches in diameter. The area of the

$\frac{A}{4}$
piston on top in each case is — since
the area of each piston is 1-4, the area of the original. The weight in each case is $\frac{W}{8}$. The four pistons together

have the same top area as the big piston or A, but the sum of their weights is one-half the weight of the original piston or $\frac{W}{2}$. Thus, by decreasing size

we have obtained an equal piston area and have cut the reciprocating weight exactly in half. Since the same law applies to connecting rods it can be followed all the way through, it being acknowledged of course that below 3 inches, mechanical difficulties of construction come in which limit carrying this law to the extreme.

The internal friction on the four pistons would be the same as in a single big piston, as the side area of all four is equal to the side area of the original big one. The angularity of the connecting-rod would presumably be less with the small piston than with the large, as the light weight would not make the matter of keeping the angle small of so great moment. This law as explained in regard to pistons will at once explain the advantage of the long-stroke motor for high-speed work and an advantage which I think has not yet been explained

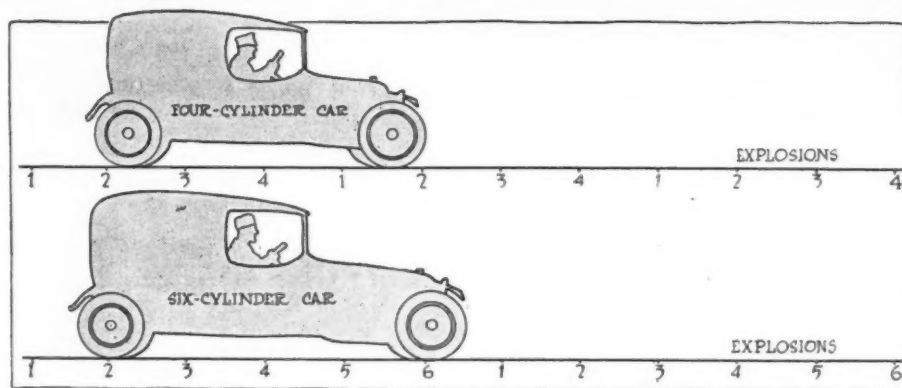


Fig. 6—Flexibility is shown by the number of explosions per mile whether the motor is four or six and is the result of gear ratio, not the number of cylinders. A high-speed four approximates a medium-speed six in performance

satisfactorily by any line of engineering argument heretofore published.

Having found the advantage of small piston size and presuming that the 6-inch bore piston in the first place was fitted to a 6-inch stroke engine—according to old-time practice—there will immediately be seen a reason for the long stroke in connection with the small piston, that the volume ratios may be kept as nearly as possible the same. In actual practice few motors are built in this country with two ratio stroke, but just what ratio is best has been ably handled in former articles. By shortening the bore-stroke ratio, however, little is lost for with pistons of half the weight the r. p. m. can be run up to a point where the piston's speed rate is very much higher than it was in the first case with the large piston. This ability to make higher speeds with the reciprocating parts very much more than compensates even should the stroke be decreased almost in proportion.

It will be noticed in Fig. 2 that our cylinder volume has decreased in proportion to surface enormously. Whereas the large cylinder has a volume W and a certain outer surface or cooling area, A the small cylinder has one-fourth the cooling area A , but only one-eighth the volume V of gas to cool, providing the cylinder length has decreased in proportion.

Fig. 3, however, shows the motor with the long stroke; this has one-fourth the piston area but the same stroke as in the first case, so that the volume of the small cylinder is one-fourth of the original. In this case, four-cylinders would show the same cubical capacity as the original one-cylinder at the right. The four-cylinder motor, however, as explained, shows but one-half the reciprocating weight of the single-cylinder, large-bore motor of the same piston area and the same volume.

It does not require any argument further to show that the maximum efficiency motor from this law alone must be a motor of high r. p. m. and small bore.

There are other reasons in the mech-

anism which allow the motor to make this r. p. m. beside that of weight of reciprocating parts. Fig. 2 illustrates Newcombe's law of sizes as applied to the complete cylinder, showing cylinders of 3 and 6-inch bore fitted with valves of one-half the cylinder diameter and in the head.

The smaller cylinders have one-eighth the volume of the big cylinder but the valves are one-fourth the area so that the valves in the smaller motor have just one-half the gas to handle per square inch of valve area that the big motor has, so that the smaller the cylinder the greater carrying capacity the valves will have.

While the small cylinder holds one-eighth of the gas in its volume it has one-fourth the cooling surface, so that theoretically at least twice the number of heat units can pass through the cylinder per minute.

Overhead-Valve Type

Engineers agree that the theoretically ideal valve construction is the overhead type. They admit from 12 to 15 per cent. more power from the same bore and stroke as with an L-head. The overhead valve in the large-bore motor is too noisy, however, for commercial use.

Valves in a small-bore motor can be built in the head and still be wonderfully quiet, as the valves in the smaller cylinder shown weigh one-eighth as much in the big cylinder. This less weight added to the lesser area enables the designer to fit valve springs much lighter in tension per square inch of valve area than in the big motor—less than half in practice. The possibility of overhead valves in a small-bore motor, however, adds greatly to its efficiency value. The same discussion of valve sizes applies also to L-head, block motors where the close proximity of the cylinders limits the size of the side-by-side valve. The use of small bore increases the valve carrying capacity with the same diameter.

In calculating the horsepower of a motor one cannot judge by the bore and

stroke. A motor from which we obtain 12 horsepower the foreigners increase to 30 or 40 by the application of high speed principles, and one must consider r. p. m. as a basic factor in judging any motor.

Long life in a motor depends very largely upon the rigidity of its parts. This term rigidity should not be confused with the term strength, for by strength one thinks of immediate breakage whereas rigidity is a factor toward decreasing vibration and stress on bearings and working parts. There are many motors today which can turn over at 3,000 r. p. m. but whose practical working road speed is not over 900 r. p. m. The parts sustaining the moving factors of the mechanism are not of sufficient rigidity to allow bearings, oiling systems, couplings, etc., to stand the continued vibration or distortion.

Crankshaft's Critical Speed

Practically every motor of limited commercial r. p. m. can figure its limit of r. p. m. from the critical speed of the crankshaft. Every shaft, no matter what its size, has a critical speed, as shown in Fig. 4. The diagram is of a support on two bearings a considerable distance apart. One can rotate the shaft between these bearings slowly and it will work perfectly and last forever. As the speed increases, however, centrifugal force develops a whip at the center of the shaft, induced by the natural deflection of the shaft under its own weight between centers. This starts the center of the shaft whirling like a child's skipping rope, as shown by the dotted lines, and the speed point at which this whipping develops is known as the critical speed. If one gets above this speed a shaft will again find its center until at another point of higher r. p. m. it finds a second critical speed, and here it will be found that there is a node at the center of the shaft and a whipping in two directions from it, as shown in the lower sketch of Fig. 4. This indicates that a center bearing on a shaft may double possible motor speed with the same diameter crankshaft.

Crankshaft critical speed is the answer to the failure to date of the high-speed, six-cylinder motor of commercial type. For high-speed work a short crankshaft is necessary.

Every discussion which the writer has seen favoring the six and eight-cylinder types over the four has been taken largely from the standpoint of even-power torque. This is not the basic reason for the eight-cylinder motor or the four and not its chief advantage over the six. The writer prefers the four or the eight for reasons of mechanical limitations which no one has been able to overcome in the six.

The first deficiency of the six is its extra length and its extra weight, so that while one adds power in building a

six he does not add equivalent power per pound, for the r. p. m. possibilities of the six are far below that of the four as a commercial-design proposition.

Two-Bearing Four

A four-cylinder motor can be built with two bearings on a very short crankshaft of large diameter. The extra diameter of this crankshaft makes little difference, as it is largely flywheel weight. This motor is a well-balanced motor for without the center bearing the crankshaft itself is in rotating balance and hence does not throw side stress on the bearings through its centrifugal deficiencies. In the six there cannot help but be a certain amount of distortion at high speeds which throws the engine out of balance. It is almost impossible to build a six cylinder motor which will not show critical speed in its crankshaft.

Supposing that in Fig. 4 one end of the long shaft shown were held in a vise. Supposing a wrench or crank were put on the other end and a 1,000-pound load was suddenly dropped on the end of this crank. There would be a certain amount of twist in the length of this shaft no matter how rigid, this twist depending on the leverage, the length of the shaft and diameter. A shaft one-third shorter would show far less twist effect with the same load and hence the shorter the shaft fitted to a high-speed motor the less will be this twist of the shaft. *This torque twist is not to be confused with critical speed and shaft whipping as this is another condition.*

In a six of fairly large size to throw one piston out of line for 100th of an

inch at high speed is enough to create very great internal stress in the motor, and at high speeds this is felt in all six-cylinder motors. The six in large sizes through its mechanical crankshaft limitations must be a slow-speed motor.

Answering the argument of even-power torque in favor of the six-cylinder motor, there is no difference between the power torque of a six or four in its effect on the car *provided the number of explosions per mile be the same.*

A high-speed four, that is a four on a comparatively low gear ratio giving, say, 6,000 explosions per mile, will show the same flexibility and low speed running as a six, and in far less weight, provided the six is higher geared to give the same 6,000 explosions per mile. The extra two cylinders of the six are to give greater motor flexibility and the six is more flexible at slow speeds, but by making the four with a gear ratio giving the same number of explosions per mile as the six the four does not have to run so slowly to drive the car equally slow with the six.

The deficiency would seem to be therefore at the higher speeds, for ordinarily a low gear means a hindrance of maximum speed possibilities. With the new fours this is not the case. A small-bore motor can turn over so much faster maximum than a six of large bore that it more than makes up for the deficiencies of the low gear ratio. Small-bore, well balanced fours with big crankshafts and rigid construction, with pressure feed oiling, as in European motors, can keep up from 2,500 to 3,500 r. p. m. for long periods without undue strain.

There are more periods of stress, it is true, as there are more revolutions and more explosions, but each one is far less than in the slower speed types.

Eight Outlook Bright

Since it is hard to make a high-speed six, and since there is advantage in the modern high-speed motor, the outlook for the eight is very promising. With large cars where a bore of 3 inches or thereabouts is not large enough it is very probable that the eight-cylinder will come into prominence. This motor can be built shorter than the four of equal power and lighter. Through the law explained at the beginning of this article **THE PISTONS OF THE EIGHT WEIGH MUCH LESS THAN THE PISTONS OF THE FOUR OF EQUAL CYLINDER CAPACITY.** The thrust per explosion will be less and the centrifugal force of the moving parts less so that **THE SAME SIZED CRANK WILL GET LESS WEAR THAN IN THE ORIGINAL FOUR.** The flywheel weight can be less on account of more even torque and because **THE PISTONS AND RODS FORM PART OF THE ROTATING WEIGHT.**

With the lighter moving parts the r. p. m. possibilities of the eight should lead to wonderful speed performance, making a low gear ratio possible and quick acceleration. For small cars the high speed four motor is wonderfully efficient and reliable. For big cars the eight has a great possibility. For slow speed motors the six will continue to be popular.—WILLIAM B. STOUT, Chief Engineer, Scripps-Booth Co.

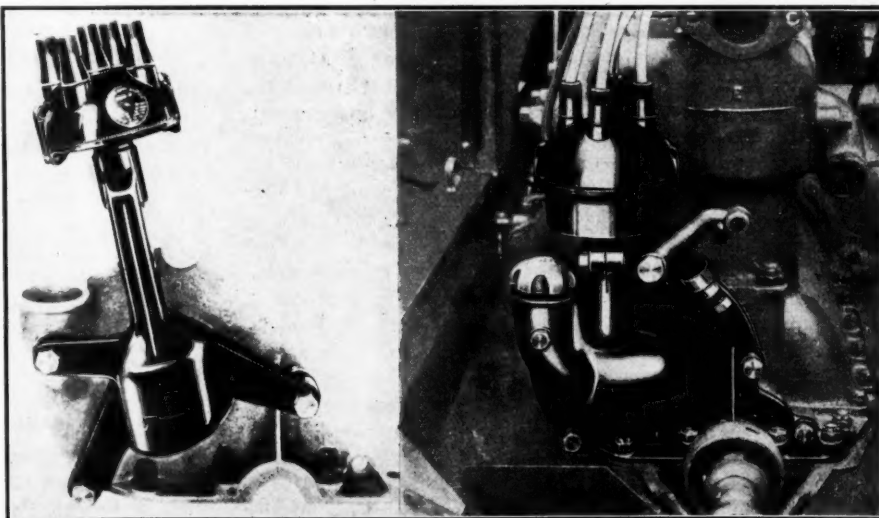
Ford Unisparker Has Automatic Advance

TO drive without thinking about the spark advance, to crank the motor without danger of a back kick and without spinning are the features offered by the adaptation to the Ford car, of the model K-2 Unisparker made by the Atwater Kent Mfg. Works, Philadelphia, Pa.

The device is mounted in a special gearcase cover which replaces the regular one and which can be attached without any fitting. Retard of the spark when cranking the motor is automatic and when the speed of the motor increases the spark advances, thus eliminating the hand control. The spark lever is removed as it is not needed. Spark advance is maintained up to 2,400 revolutions per minute and this range is ample for Ford requirements.

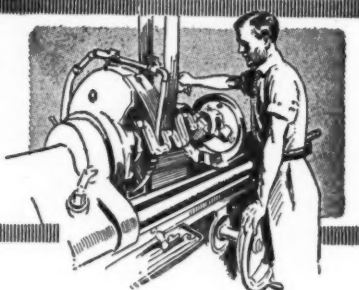
The price of the new instrument is \$28, which was formerly the figure at which the type H instrument for Ford cars sold at. Recently the price of the type H was reduced to \$22. Either of these models costs \$2 more when a kick switch is furnished.

Current is supplied by a 6-volt storage battery or a six-cell dry battery, and it is stated that a set of dry cells will last 2,000 miles. The Ford magneto may be used for lighting.



At the right is illustrated the new Ford Unisparker with automatic advance. At the left is the instrument as made without automatic advance

The Rostrum



This department is for the instruction of the readers and all are at liberty to ask questions. Give full name and address so that we may send you a reply by letter if there is no space in the Rostrum. If you wish to sign a fictitious name, also sign your own.

Reasons for Advancing Spark Lever

EDITOR THE AUTOMOBILE:—In answering a question in the issue for December 10 you say:

"The necessity for advancing the spark is brought about by the fact that it takes a definite time to produce the spark, that is, from the instant the breaker points separate on the magneto until the spark occurs in the cylinder a small amount of time is consumed."

Now I know that this is the popular explanation for the necessity for advancing the spark, yet when we remember that the electric current travels several thousand miles in a second and that the distance from the breaker points to the spark plug is at the most only 3 or 4 feet it seems to me that this reasoning does not satisfy. Although I am a motorist of 10 years' standing I have never yet heard or read of a good explanation of this matter of spark retard and advance and the fact that the question of automatic or hand control is far from settled shows that this matter is not understood.

2—Any information regarding this question of spark advance will be appreciated. For instance, can you explain why advancing the spark so that the ignition occurs before the highest point of piston travel increases the power when the motor is speeded up?

East Canaan, Conn.

D. C. CANFIELD.

—1—It takes time to produce a spark because of certain secondary effects that occur when a circuit is closed or opened. Suppose we have a spark coil and close the circuit. It is natural to believe that immediately the flow of current would rise to its full value, but it does not, for the reason that the flow of this current is opposed by a counter electromotive force which the current itself generates. This counter electromotive force, or voltage, however, gradually dies down so that the current eventually rises to its full value.

Magnetic Field Set Up

It is common knowledge that when a current flows in a wire that the space surrounding the wire is magnetized, or to use the technical term there is a magnetic field around the wire, the greater the current flowing the more intense this field. It is also well known that whenever there is a relative movement between such a magnetic field and *any wire within the influence of the field* a voltage is induced in this wire and a current flows. This principle is used in generators by moving the wires on the armature with respect to the field magnets, and in an induction coil this relative movement between secondary coil and primary magnetic field is produced by suddenly increasing or decreasing the strength of the field. The increase or decrease, as the case may be, induces a current in the secondary.

Since the primary magnetic field when it increases or decreases in strength causes a current to be generated in the secondary, it is only natural that this change in field strength will also produce a voltage in the primary winding itself, self-induction is what it is called. This voltage is in the opposite direction to the line voltage which is causing the current to flow. Therefore, when a current starts to flow it cannot rise to its full value immediately. It starts out with a rush when

the circuit is closed but this causes a large back voltage to be generated; little by little the rate of current increase falls until the current reaches full value.

There is also some delay when the spark is produced by breaking the circuit due to self-induction in the secondary circuit and mutual induction in primary and secondary, but the delay is not so great because the flow of current due to the back voltage in the primary circuit is in the same direction as the flow due to the line voltage.

2—Since it does take an appreciable amount of time to produce the spark after the circuit has been closed or contact broken according to the system employed, it is necessary to advance the spark lever as the speed of the motor increases in order that the spark may be produced at exactly the same instant.

Why Advance Is Required

When the motor is running slowly, say 300 revolutions per minute, it takes a comparatively long time for the piston to complete its cycle and therefore if the spark is to occur just as the piston reaches top dead center the circuit breaker does not have to open much sooner. If it takes .01 second for the production of the spark after the breaker points separate, then the spark lever must be so set that the breaker points will open .01 second before upper dead center is reached.

Suppose now that we increase the motor speed to 3,000 revolutions per minute, the piston now is moving ten times as fast as formerly yet it takes just as long for the spark to be produced. Therefore if the spark is to occur at the instant the piston reaches top dead center, the spark lever must be advanced so that the breaker points separate long before dead center is reached.

So much for the spark lag; but it also takes a small amount of time for the charge to burn, and although this interval may not be appreciable when the motor is running slow it must be taken into account when the motor is running at full speed; therefore the spark must be advanced still further if the charge is to be completely ignited when the piston reaches top dead center, and since maximum pressure rise occurs somewhere near the point at which the burning of the charge is completed and since it is advisable to have the point of maximum pressure attained at about the time the piston reaches top dead center if best power and economy are to be obtained, it is best to have the combustion of the charge about completed when the piston reaches top dead center.

Reason for Vibrators on Ford

Editor THE AUTOMOBILE:—1—What is the address of the Simms Magneto Co.?

2—Since the Ford magneto produces an alternating current, why is it not possible to discard the coil vibrator in its electrical system?

3—Again, why will not the four-point timer, of the conven-

tional type, in a system with four non-vibrating coils produce results like a circuit breaker, a non-vibrating coil and a distributor system?

Rices Landing, Pa.

J. A. SHARPBACK.

—1—Simms Magneto Co., Bloomfield, N. J.

2—It would be possible to discard the vibrator but if this were done only one spark would be produced each time the circuit was closed instead of several.

3—For the sake of clearness the two systems are illustrated in Figs. 1 and 2. The main reason that the four-unit coil non-vibrating system, you suggest, will not work satisfactorily is that a weak spark is produced when the primary circuit of any coil is closed, a much stronger spark being produced when the circuit is broken—which is the method employed in the breaker system. Also with the breaker the sparks are much more accurately timed.

With the four-unit, non-vibrating coil system the spark is produced as follows: The timer closes the circuit, and the current builds up to full strength in the primary circuit. While the current is increasing in strength the magnetic lines of force around the coil (due to the current) are also increasing in number. The increasing strength induces a current in the secondary, the exact amount of which is dependent on the rate of current increase in the primary. As previously stated, the current in the primary rises to its maximum value comparatively slowly, due to various electrical effects.* It is seen that the voltage generated in the secondary must be greater when the speed at which the lines of force multiply is greater, but this rate of increase when the circuit is closed is limited by a phenomena known as induction.

Now when the magnetic field of the primary coil is decreasing in strength, a voltage is also induced in the secondary. In other words, either an increase or decrease of magnetic field strength will produce a voltage in the secondary. By breaking the circuit the reduction of field strength is exceedingly rapid. The rate of decrease is much more rapid than the rate of increase under the most favorable circumstances. The result is that this increased rate produces a higher voltage in the secondary, and due to the higher voltage a greater current flows, and the larger the quantity of current the hotter the spark.

In the breaker system, you mention, the circuit is broken to produce the spark and therefore this is superior to the four-unit coil, with timer system.

You have failed to recognize, apparently, that the number of coils really has nothing to do with the proposition. You might have a single coil with a single contact timer and then place a distributor in the secondary circuit to deliver the sparks to the right cylinders in turn.

Hydrometer for Anti-Freezing Solutions

Editor THE AUTOMOBILE:—I have a 1913 Cadillac car. When the cold weather first started I put two quarts of alcohol and one pint of glycerine in the radiator and whenever the car is filled, I mix 25 per cent. of alcohol with 75 per cent. water. We have had many warm days since the mixture was put in the radiator and undoubtedly the alcohol evaporates more quickly than the water. Therefore I do not know at present how much alcohol there is in the radiator.

Is there any way of ascertaining this from time to time so as to know whether to put more alcohol in or not?

Buffalo, N. Y.

CHARLES HINES.

—If there has been no leakage in the cooling system, it will be sufficient to add alcohol because the amount of water that has been evaporated is negligible, for the reason that alcohol has a much lower boiling point than water—and of course, there is no danger of the glycerine evaporating.

But if some of the solution has leaked out and you know

the specific gravity of the original mixture you may easily determine whether to add alcohol or water or both by means of a hydrometer. Take the specific gravity of the radiator compound and then add water or alcohol to bring the gravity to its original value. In case you do not know the specific gravity of the original mixture you might calculate it as follows:

Specific gravity of mixture = percentage of water by weight + the percentage of alcohol by weight $\times .83$ + the percentage of glycerine by weight $\times 1.27$.

Ford Jerks—Bands Worn

Editor THE AUTOMOBILE:—1—I have a 1914 Ford model T which always starts with a jerk, either forward or reverse. I have tried tightening up and also slacking the bands but the trouble is still present.

2—Also this motor is very difficult to start even when warm. I have ground the valves. When running it has plenty of power.

Hawthorne, Mass.

H. J. PIRIE.

—1—Probably the lining on the hands is worn out. These should be relined or new bands substituted, whichever is more convenient—the cost in either case is small.

First remove the cover plate on the top of the gearbox, Fig. 4, turn the reverse adjustment and brake adjustment nut to the extreme end of the pedal shafts, and then remove the slow speed adjusting screw. Take off the upper half of the gear box. Slip the band nearest the flywheel over the first of the triple gears and turn it around so that the opening is downward. The band can now be removed without any difficulty. The operation is more easily accomplished if the three sets of triple gears are so placed that one set is about 10 degrees to the right of the center of the top.

In putting the bands back in place pass a cord around the ears of the three bands to hold them in place so that when the gearbox cover is put back no trouble will be experienced in getting the pedal shafts to rest in the notches in the band ears.

2—Adjust the carburetor to give a richer starting mixture and then if the trouble persists look for it in the ignition system.

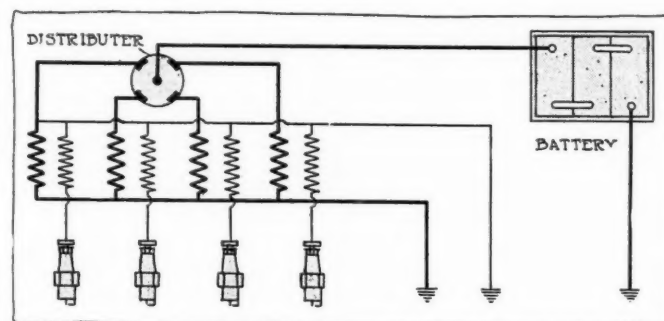


Fig. 1—Diagram showing four-unit coil system with timer, but without vibrators

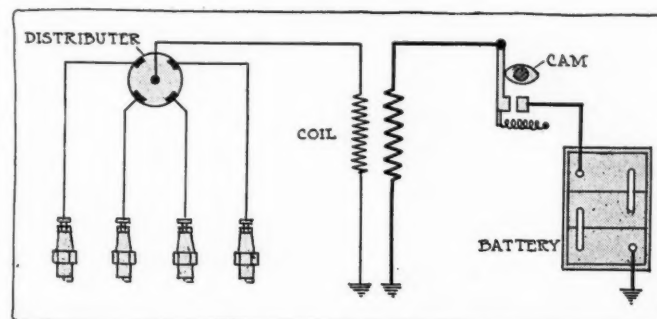


Fig. 2—System with single coil distributor and cam-actuated breaker

*See answer to D. C. Canfield's letter on preceding page.

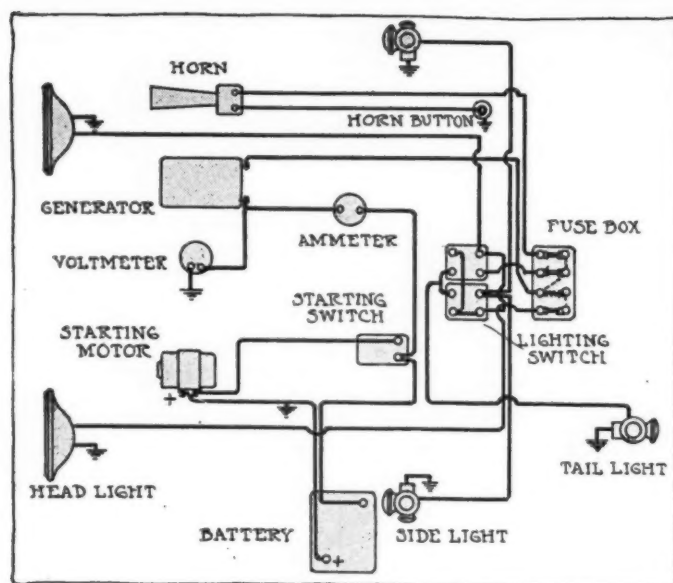


Fig. 3—Hupmobile starting and lighting wiring diagram for 1914, showing installation of ammeter and voltmeter

If the contact points are worn, dirty or out of alignment the vibrator will not work properly. The usual method of adjustment is to turn the adjusting screw up until the vibrator stops buzzing, then screw down slowly until the two points just come together and the explosion in that cylinder becomes regular. In adjusting K-W coils it is important to see that the little flat cushion spring underneath the vibrator bridge works back and forth every time the points make and break contact. This action can be determined by taking the unit out of the box and holding it up to the light; then press down the vibrator and observe the operation of the cushion spring. It is important to have all the units arcing adjusted alike. Too close contact between the adjusting screw and the vibrator will cause arcing, thus hindering the flow of the current, burning away the contact points and often putting the coil out of action. If the points become pitted or worn so that imperfect contact is made, they should be filed with a flat thin double-faced file so that the surfaces meet each other squarely.

How to Attach Electric Meters to Hupp

Editor THE AUTOMOBILE:—I have a 1914 Hupmobile with Westinghouse starting, lighting and ignition system. Would you kindly explain how a voltmeter and ammeter could be best wired from the dash to the generator?

Woodstock, Vt.

E. H. REED.

—The wiring diagram is shown in Fig. 3. The voltmeter should be connected between the terminal on the generator and a ground on the motor or frame. The ammeter is connected into one of the main wires leading from the generator.

Garage for Twenty Cars

Editor THE AUTOMOBILE:—Fig. 5 shows a plan of a proposed garage on which we would like your advice.

1—How many cars do you estimate this garage would hold, considering that there will be a machine shop with a planer, lathe, drill press and gas engine?

2—Is there room to store cars lengthwise along the narrow wing of the building, and yet have room to drive by?

3—Where would be the best place for the office and accessory sales room. We do not expect to have a separate room for showing our new model cars. Both streets are main ones and have about an equal amount of motor travel.

4—In the Winter we do not have any cars running so we

have the entire space for car storage. How many cars do you think it should hold in Winter?

Crestline, O.

F. H. R.

1—You can store about twenty cars according to the design shown in the figure. The exact number depends largely on the average size of the cars because different arrangements may be made according to whether the cars are large or small.

2—There should be room to store cars along this passage way, although there will be no room to spare. Two cars may be placed in the driveway as shown in the figure without causing any great amount of inconvenience. One of these cars gains entrance from the street side of the small wing and the other comes through the main garage.

3—The position of sales office and accessory store are shown in the illustration.

4—In Winter you might be able to store as many as thirty cars of medium size.

We believe that this is a very poor shape to make a garage. It is very difficult to use the space to full advantage. A more regular plot of ground would be found more satisfactory.

Medium Temperature Best for Varnish

Editor THE AUTOMOBILE:—Regarding the storing of a machine for the winter, I would like to have the following questions answered:

1—Which is the better for the paint and varnish of the machine, a cold or warm storeroom?

2—Should the tires be empty or inflated?

3—Should the tires be kept in a cold or warm place?

4—If it is advisable to put something in the cylinders (to keep the engine parts from rusting, etc), what should be put in?

5—Should anything be done with the storage battery?

Cleveland, Ohio.

HENRY L. HOSSLER.

1—A room of medium temperature is best, around 50 degrees. Temperatures above or below this figure are not particularly detrimental, however.

2—The tires should be removed from the rims, wrapped to keep out the light and laid flat. When they are stood up they deflect out of shape due to their own weight. The best atmosphere for tires is a dry one with the temperature around 50 degrees.

3—Answered above.

4—There should be enough lubricating oil from the last time the motor was operated to protect the surfaces and keep them from rusting. You need not worry about this.

5—Before storing a battery for the winter it should be put in the best possible condition, for the effects of deterioration are more or less cumulative. If it is known that a battery is in a very inefficient condition, that one or more cells are below par, that plates are sulphated, terminals corroded or jars cracked, the obvious thing is to have the conditions corrected before storage. Otherwise the battery, or at least part of it, will show considerably more than normal deterioration when again placed in active service.

Assuming that the battery is in good condition, the cells should be examined to see if they contain sufficient electrolyte to cover the plates well; if the liquid is below the depth recommended by the manufacturer the deficiency should be made up by adding distilled water or filtered rain water. Under no ordinary circumstances should acid be put in. There should be at least .25-inch of electrolyte above the plates; the depth varies slightly in different batteries.

A full charge should be given at normal charging rate, which varies according to the make and size of the battery; the charging rate almost invariably appears on the nameplate. Hydrometer tests of fully charged cells will vary a few points.

In the absence of specific instructions as to the proper density of the electrolyte, as indicated by the hydrometer at the

end of a charge, it will be perfectly safe to assume that if the figures are anywhere between 1.275 and 1.300 the battery is in fairly good condition. The battery should be charged in the usual way, with slow finishing rate maintained until the hydrometer tests show no variation at half-hour intervals. If some cells read lower than others it is probable that they will continue to raise their test readings after the others have stopped rising. In such a case, continue the charge until the gravity ceases to rise in all the cells; the overcharging will not injure the cells if it is not carried beyond a few hours at a very slow rate.

Moderate Temperature Best

Batteries are best stored where there is a moderate temperature, and usually the makers recommend that they be kept where they will not be exposed to frost. At intervals a freshening charge should be given. As to whether the batteries should be removed from the car or not, the question is one for individuals to decide. If the cells can be kept clean, at moderate temperature and occasionally charged and inspected while in the car there is no objection to leaving them there. Otherwise they should be removed.

Change Every Two Weeks

As to how often freshening charges should be given, different makers give different instructions. The Willard company states "After being fully charged when put away, the battery should have a freshening charge by gravity test at least once, and preferably twice each month at the finishing rate given on the battery nameplate." The recommendations of other makers are given here.

Before the freshening charge is given, the cells should be inspected to make sure the electrolyte is above the tops of the plates. If the plates are exposed, the dry parts are liable to sulphate, while the electrolyte, made stronger by the fact that the water evaporates out while the acid does not, will have too sharp an action, and if charged and tested in this condition the hydrometer readings will be too high.

Dry Storage

Storage battery plates can in some cases be stored dry, if the trouble of charging and inspection is considered too great or if the idle period is to be very protracted—say 8 months or a year. The Gould company instructs that the battery for dry storage should first be fully charged, the cells disconnected, elements removed and positive and negative groups separated. Positive groups are allowed to dry without washing and with the acid on them. Negative groups are rinsed in water, set on a clean bench until they begin to steam, when they are sprinkled or dipped in water and again allowed to stand. They will heat and steam again, and the cooling process must be repeated, alternating with steaming, till the plates will stand without getting warm. They are then soaked for 3 or 4 hours in electrolyte of 1.275 specific gravity, dried without washing and stored. The electrolyte from the cells and the wood separators are thrown away, as they cannot again be used.

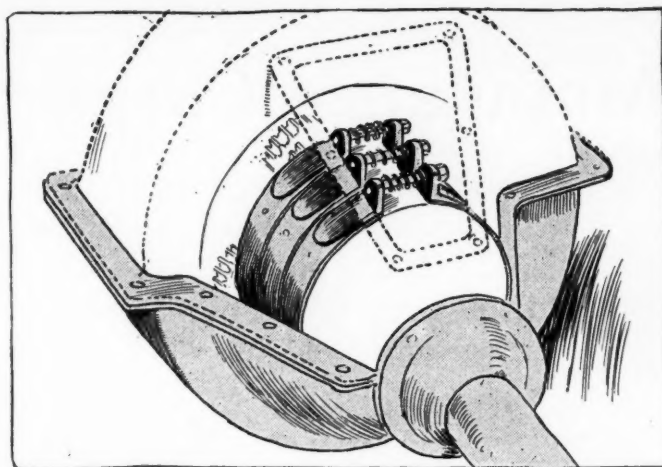


Fig. 4—Ford gearset, showing bands to be relined

The makers of the U-S-L battery state: "If the battery is drained thoroughly, washed with water and again drained carefully and then hermetically sealed, it can be stored dry for two months with every assurance of safety. The factor which would determine the length of time before the battery would commence to be injured is the drying out of the wood separators. As long as the wood separators remain moist the battery will be safe."

—One of the most important things to do, and one which you apparently have overlooked, is cleaning the car properly. If you store it the way it is, it will be very difficult to properly clean the car in the spring after the dirt has been left on the body and in the top for several months. Put the top up and brush it thoroughly, then wash it with lukewarm water and castile soap. Next clean the upholstery carefully. After this is done wash the body, first softening all mud with a gentle stream from a hose. Do not rub the mud loose by means of a sponge, if you care to perfectly preserve the body finish. After all mud and dirt have been removed, dry the surface with a soft shammy. Finally polish all metal parts and rub lubricating oil over these parts to keep them from tarnishing. The oil may be removed with warm soap and water in the spring.

Drain the water from the radiator and flush it to remove sediment.

How to Patch Celluloid

Editor THE AUTOMOBILE:—To patch a celluloid window, moisten the surfaces with acetone and press together. It holds securely and will be just as transparent as before.

Port Clinton, O.

W. BUZZELL.

From Chicago to Florida

Editor THE AUTOMOBILE:—I am contemplating a trip to Florida in the next few weeks, and would like to have information as to the best route from Chicago to Jacksonville, Fla., by way of the Mammoth Cave of Kentucky.

Minooka, Ill.

GEO. O. JACOBS.

—Probably the best way according to the *Automobile Blue Book* will be through South Bend and Indianapolis. Starting from Chicago the route runs through Lafayette and Indianapolis to Louisville. From thence to the Mammoth Cave to Nashville, Chattanooga, Atlanta, Macon, Valdosta, Jacksonville, your destination.

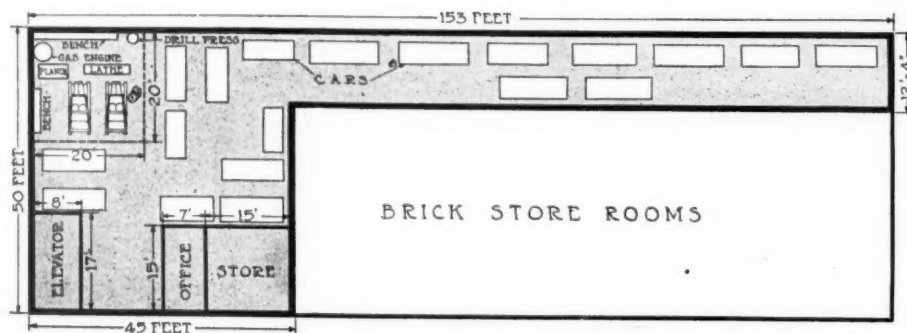


Fig. 5—Plan for garage, accessory store and machine shop

Ambulance Corps Dispatched to Front

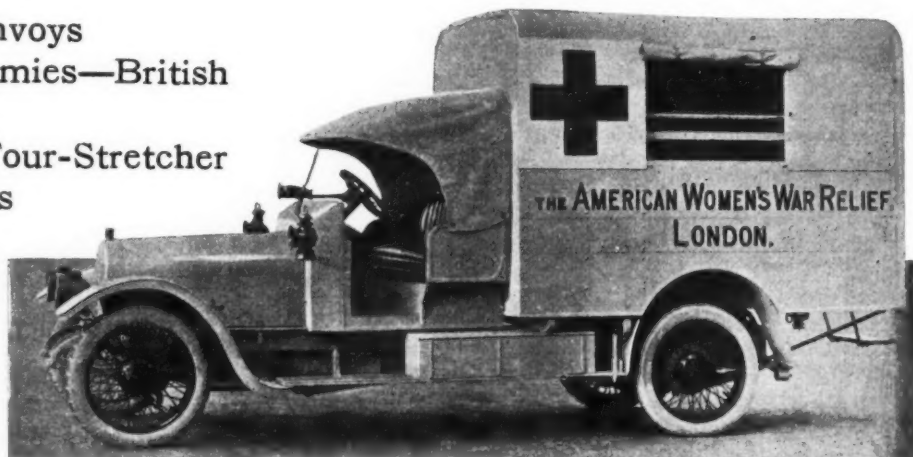
Many Motor Convoys
for Aid of Embattled Armies—British
Red Cross
Standardizes Two- and Four-Stretcher
Body Designs

LONDON, ENG., Dec. 1—The motor ambulance convoy for the British army in France has been dispatched to the front. It consists of forty-one ambulances, two traveling workshops, three trucks of stores, three officers' cars and ten motorcycles, and it now forms a permanent unit of the Army Service Corps. The personnel comprises five officers, eight non-commissioned officers and 136 men, all the non-commissioned officers and men being expert mechanics and good drivers. It is understood that the general design and equipment of the ambulances have been approved by Lord Kitchener. This convoy was organized by Col. Arthur du Cros, who is organizing similar corps for the Indian and Colonial Expeditionary forces. The colonel and his friends have promised to supply at least ten of the motor ambulances required.

Red Cross Requirements

In this connection it is interesting to note how the British Red Cross Society is co-operating with the government and the war department in standardizing and obtaining a supply of motor ambulances.

The work of the society in this is to act as a supplementary organization supporting the war department and ready at any time to meet emergency requirements which could not be anticipated, and cannot conveniently be filled by the motor ambulances owned by the government. This being the case, the problem from the point of view of the society divides itself broadly under two heads, namely, the provision of chassis and the provision of temporary ambulance bodies.



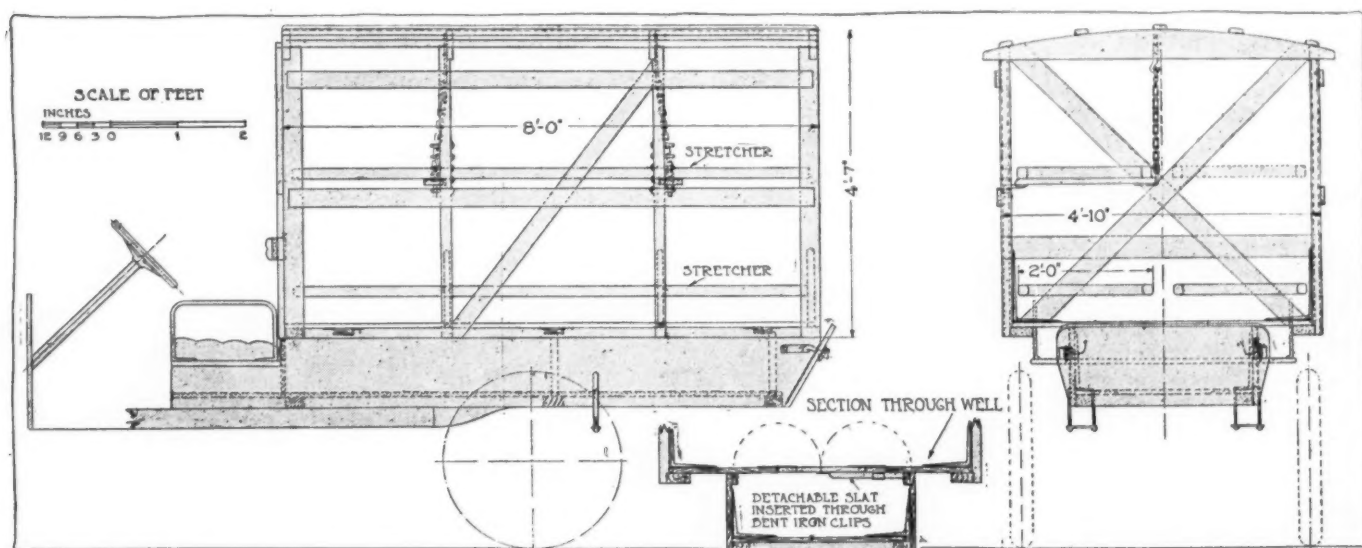
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One of the automobile ambulances furnished by the American Women's War Relief of London. The body, a rear view of which is given on the opposite page, is a four-stretcher design built in conformity with the specifications of the British Red Cross Society

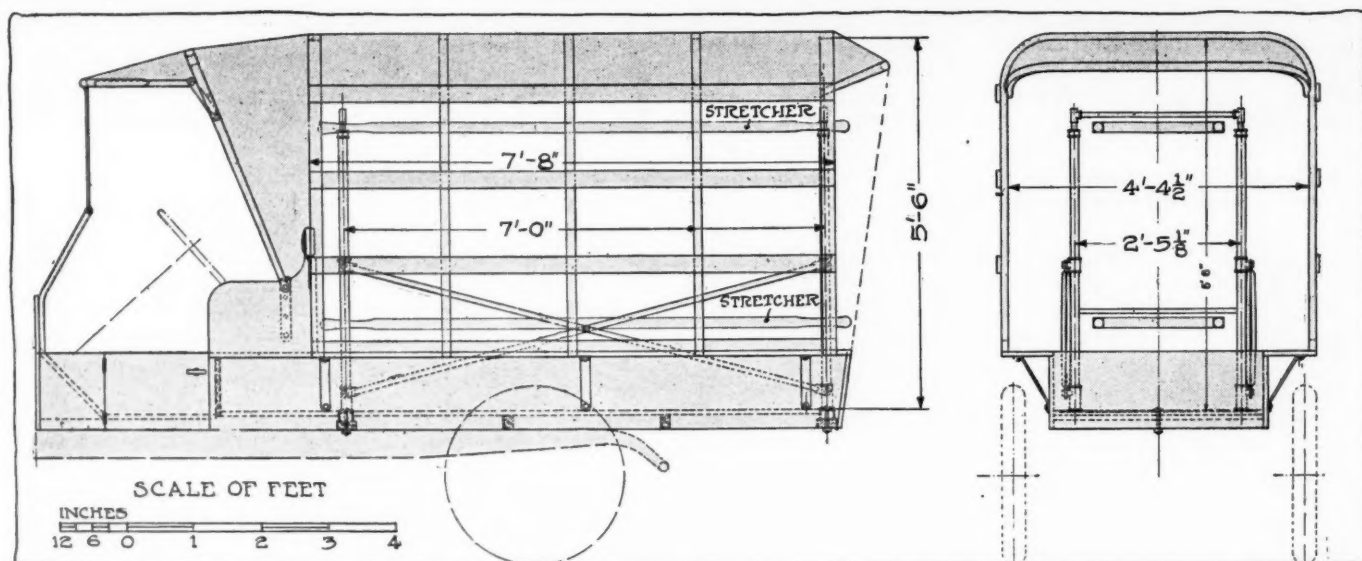
The former requirement is the more numerous, because good use can be made not only of ambulances, but also of comfortably equipped touring cars for the carriage of wounded men. A very large percentage of these are able to travel in an ordinary vehicle not fitted with stretchers, and consequently, the society has expressed itself anxious to hear from car owners who would be willing to make their cars, particularly if fitted with spacious inclosed bodies, available at short notice for this sort of work.

Emergency Ambulances Needed

At the same time, a considerable number of emergency ambulances certainly ought to be provided. At ordinary times, the design of a motor ambulance, so far as the chassis is concerned, is a matter rather for the manufacturer of industrial motor vehicles than for the maker of touring cars. The speed not being particularly high, solid tires are in some cases fitted, though it is more usual to equip these machines with strong pneumatic tires of heavy section. In some instances the body is suspended on elliptical springs from the chassis, so that two distinct systems of springing are interposed between the



Working drawings of British Red Cross Society standard body for automobile ambulances of four-stretcher type with dimensions, etc.



Sketches of British Red Cross Society standard two-stretcher ambulance together with rear elevation, dimensions, etc.

patient and the road. In forming an organization hurriedly to meet requirements not exactly defined, refinements of this kind are out of the question, and probably the best course is to get the loan of well-sprung touring car chassis and to fit light and simple ambulance bodies of a type that can be constructed in a very few days. The main difficulty is in connection with the length of the chassis frame. The great majority of touring cars are not really of the right length for the work. A certain amount of space may be saved by giving the driver a somewhat narrow seat as close to the wheel as is consistent with reasonable comfort. The body itself has to be slightly over 8 feet in length to accommodate government stretchers of standard dimensions. The carriers of these stretchers are 7 feet 9 inches long, and the width of each stretcher when extended is 23 inches.

Roads a Factor

In fitting up a temporary ambulance it is necessary to take into account the fact that no one knows the nature or quality of the roads over which the vehicle may have to travel. The *pavé* roads of the Continent of Europe are calculated to cause considerable vibration in the interior even of a well-sprung pneumatic-tired vehicle, and from this vibration the patient must be protected so far as possible. Then again, very severe gradients may have to be negotiated, and consequently it would not do to overload the car.

The Standard Body

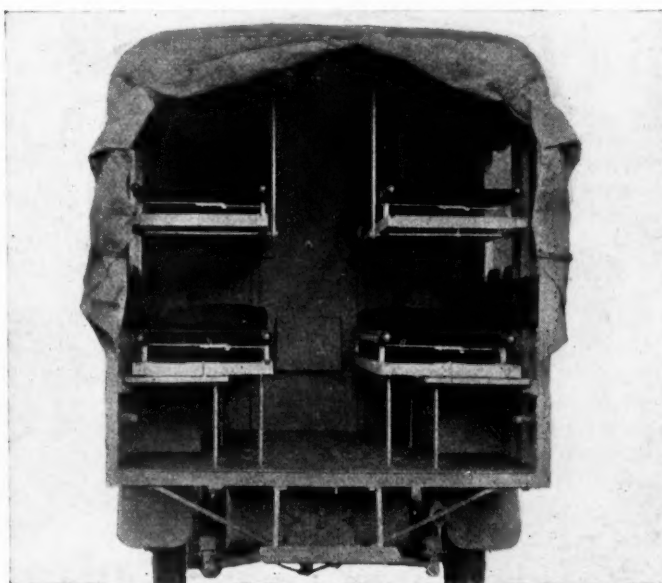
In view of these and other considerations, the Red Cross Society has standardized a body of very simple construction, and consisting of a light framework covered with waterproof canvas, and having canvas curtains at the front and back. The floor of the body has to be fairly substantial, and provided with two transverse grooves to take the base of a suitable equipment designed to carry stretchers. The equipment selected is of the type known as the L.X.R. It consists essentially of a braced framework of steel tubes. The four upright corner tubes are slotted to take the ball ends of steel cross bars from which the stretchers are suspended. The cross bars when slipped into position do not bear upon rigid metal, but upon the tops of strong coiled springs contained in the corner tubes of the structure. Each equipment takes two standard stretchers with ample head and air room between and above them.

It will be noted that the whole arrangement provides what is tantamount to a second system of spring suspension between the patient and the road surface, and this without suspending the stretchers loosely or in any such way as to

allow of any rolling or pitching relative to the movement of the vehicle itself. It has been found that if stretchers are loosely slung from above so as to be free to move to some extent, a periodic rolling motion is set up while the vehicle is traveling, and this not only gives to the patient a sense of insecurity and danger, but has a physical effect akin to that of the rolling of a ship at sea. It is, consequently, very necessary for the stretchers to be carried from the cross bars by short ropes, making them for the time being into one rigid structure with the bars from which they are borne.

A Four-Stretcher Type

Some use under certain conditions is also likely to be made of vehicles built to another design, in which the stretchers are not in any way sprung from the body, but the body itself is more stoutly constructed and is of larger dimensions. This second arrangement gives accommodation for four stretchers, two of which rest on the floor, while the other two are carried on supports slung by chains or ropes from the roof. The system should be satisfactory enough at low speeds over fairly good road surfaces, and one advantage of the arrangement is that the body can conveniently be constructed with a well,



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Rear view of American Women's War Relief four-stretcher automobile ambulance illustrated on the opposite page, showing arrangement of stretchers

the floorboards of which can be hinged back. The idea of this is that when a number of men who are able to travel without stretchers have to be carried, the well can be opened and the vehicle is then turned into a sort of rough wagonette with seating accommodation along either side. This makes it possible to carry about twelve men at a time, or alternatively, to carry a couple of stretchers on one side of the well, and half-a-dozen men sitting on the other side.

So far as the chassis are concerned, the British Red Cross Society has to depend on the generosity and patriotism of motorists who are asked to lend their cars, and, if possible, their own or their chauffeurs' services for driving, without any charge. It is an easy matter to get offers from motorists to carry out specific jobs for the government or any accredited society like the Red Cross. It is, however, far less easy to persuade them to allow their cars to be made useless for ordinary purposes for a considerable length of time on the chance of their being needed sooner or later for urgent ambulance work. At a time when everyone feels that he would like to be doing something useful, it is very difficult to get people to realize that the most useful thing to do may

quite possibly be to sit down and wait patiently until one's services are needed.

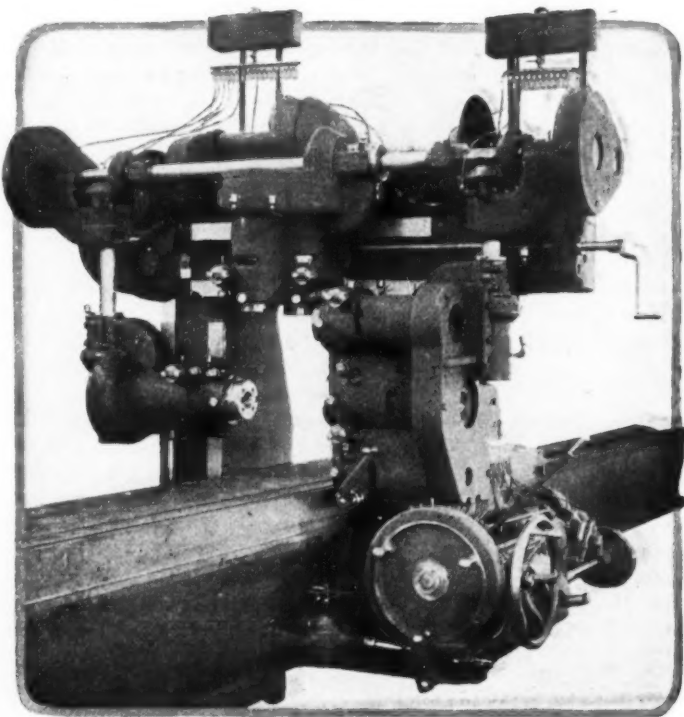
A Matter of Short Notice

It is not, of course, possible even to state with certainty whether the military authorities will need any help on a considerable scale from the British Red Cross Society as regards the supply of motor ambulances. On the other hand, it is likely enough that if such help is wanted, it will be wanted at short notice. Consequently, it is not enough to have cars ready to be converted when required; the conversion ought to be carried out beforehand, and the cars should be standing in some convenient garage available to be sent out to any point where they may be needed at a very few hours' notice. A considerable number of British motorists have offered themselves and their cars for ambulance service either at home or upon the Continent, but, as is indicated above, the main difficulty in the way of perfecting the whole organization is the uncertainty as to what will be required, and the extent to which the Red Cross Society will in fact be called into co-operation by the government.

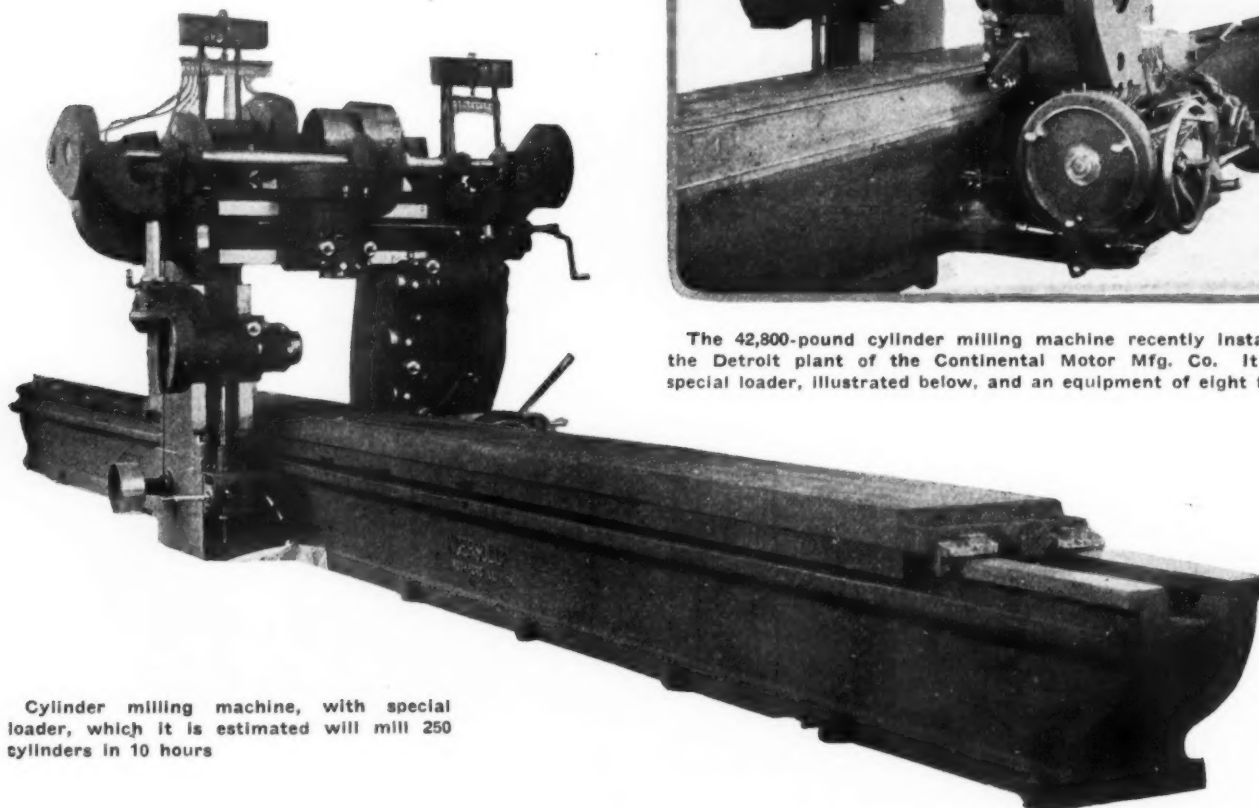
To Mill 250 Continental Motor Cylinders in 10 Hours

¶ "A 42-centimeter gun in the motor building business," is what an official calls the new 40-foot milling machine recently installed at the Detroit plant of the Continental Motor Mfg. Co. This is said to be the largest device of its kind ever built and set up in any motor plant in the world. The weight is 42,800 pounds.

¶ In order to get the machine into place, it was first necessary to tear down a section of the solid east wall of the large Continental machine room. The highest production possible will be obtained when this great milling machine is finally ready for work, with its special loader and its complete equipment of eight fixtures. It has been estimated that a new record of 250 milled cylinders in 10 hours will be set when the giant gets to grinding away.



The 42,800-pound cylinder milling machine recently installed at the Detroit plant of the Continental Motor Mfg. Co. It has a special loader, illustrated below, and an equipment of eight fixtures



Cylinder milling machine, with special loader, which it is estimated will mill 250 cylinders in 10 hours

A Field for 750,000 Trucks

Figures Based on Horse Population in United States of 25,000,000—30,000
Users Have 70,000 Trucks Worth \$140,000,000—329
Firms Building Commercial Vehicles

NEW YORK CITY, Dec. 16—"Seven hundred and fifty thousand motor trucks carrying an average load of 2 tons each would be needed to handle the freight of 2,000,000,000 tons carried each 12 months by our railroads, this allowing for 300 working days per year, and handling this freight at both ends of the line." In these words Horace M. Swetland, president of the Class Journal Co., and a pioneer in the automobile publication field as well as a critical student of automobiling, summed up the future possibility of the motor truck industry at the annual meeting of the Motor Truck Club of America held in this city tonight. Mr. Swetland in a measure verified this estimate by a consideration of the annual stock yards' report which shows that approximately 25,000,000 horses and mules are employed in this country for all purposes, and if one-tenth of these are employed solely in trucking work and assuming that the motor truck will do as much work as three horses, this brings the same conclusion, namely, that 750,000 trucks would be needed if all horses were supplanted.

8 Years' Progress

In his opening address Mr. Swetland referred to an address made 8 years ago before a national team-owners' convention at which his remarks on the future of the motor truck were received with ridicule by the team-owners present. "Today," continued Mr. Swetland, "I might further inform you, that 30,000 users have 70,000 motor trucks, an average of 2 1-2 trucks per user, representing an investment in vehicles alone of \$140,000,000; that 329 different motor truck makers are attempting to supply the demand for these vehicles; and that the daily consumption in labor and supplies for operation of these 70,000 motor trucks and delivery wagons is \$560,000; and that this expenditure produces a daily transportation of practically 1,500,000 tons of freight. To this great industry which has grown up in the past 8 years must be added the hundreds of passenger vehicles used solely in this service. Today 30,000 individual firms have adopted motor trucks.

"But this great development could not be inaugurated without many failures, without much reconstruction, without

the adoption of new methods involving the regulation of street traffic, the betterment of roads, and a thorough reorganization of the system of handling tons of freight and thousands of passengers. And, so, for many years the struggle against inefficient conditions, inefficient machines and inefficient operation has gone forward until today we are positive that the machine is cheaper than the horse for any continuous and regular service.

"Perhaps road-making has been the greatest essential to the success of this modern development, and it is true that it is possible to wade a horse through a mire hole and have him drag a few pounds after him where it would be impossible to operate a motor-driven vehicle, but the mire hole is being eliminated, and solid macadam and substantial paving have already proved essentials to both horses and machines. It naturally follows that the development of this great industry has followed the improvement of city highways and suburban roads. In the State of Massachusetts, which was among the first to preach the doctrine and demonstrate the serviceability of good roads, and which has ever lived up to its ideals in this particular, the registrations of truck sales show an increase of 40 per cent. in 1914 over 1913, and wherever the improved highway has blazed the trail sufficiently plain, the motor truck has followed and followed successfully.

Early Selling Methods

"When the salesman first started to sell trucks, he sold them on the same basis that pleasure cars had been sold, that is, on any kind of a basis to get the sale and get the money. All sorts of extravagant claims were put forth by the salesman, absolutely ridiculous and unheard of guarantees were inserted into contracts, and the over-ambitious salesman did as much to block the progress of this industry as any other single contribution. He was strongly backed up by the manufacturer, who inherited from the pleasure car business the old idea that the people would buy anything that had four wheels under it, and looked like the real thing, was foisted on an innocent and ignorant constituency. Then the owner added the last straw to the camel's back, and while he purchased a

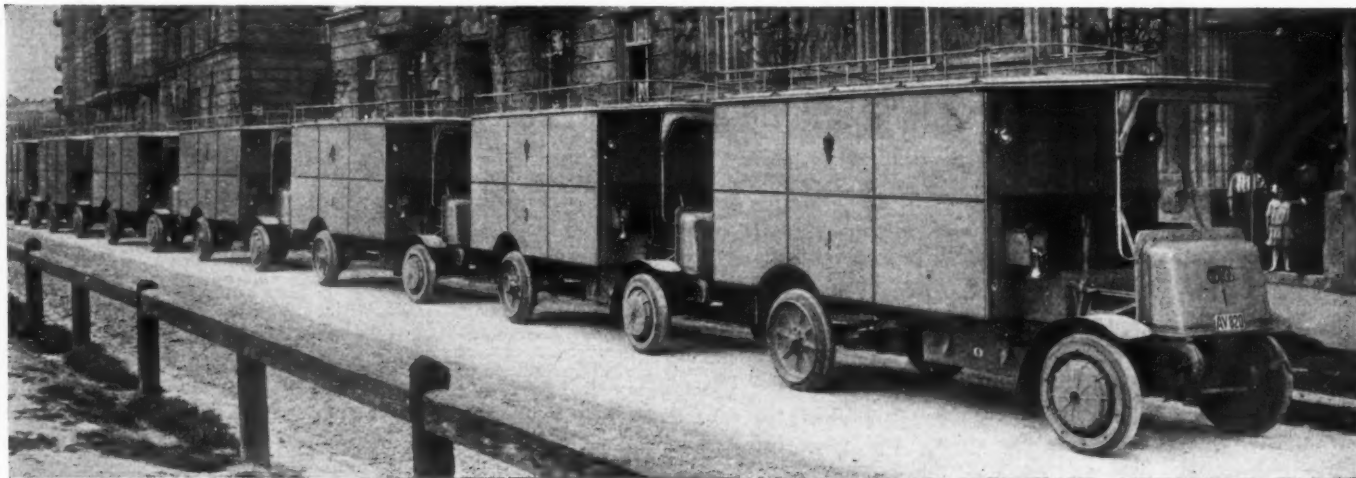
1-ton truck which the salesman had suavely assured him would carry 2 or 3, he had simply looked at the luggage space, smiled up his sleeve and said, 'I can easily put 4 tons of my material into this wagon-box,' with the result that the unfortunate machine, however well it may have been designed, and however faithfully it may have performed its 1-ton truck service, was wholly insufficient for two or three times that amount.

"The machine was not only overloaded but was placed in wholly incompetent hands, and the man who had given the lash of the whip to the horse, applied the same method to the truck, and finding the beast inanimate and insensible of his threats and his whip, had adopted the only other method which could reach its vitals, that is, that of starvation, inattention and over-driving.

A Broader Education

"If all the educational matter which is handed to us through the various institutions of learning were confined to the individual efforts of a single intelligence, our education would probably begin with the table of addition, and end in long division. The mass of educational facilities which are at our disposal today is the result of the broadest individual experience and investigation, combined with the facilities for the interchange of the information thus obtained. In this we are able to take advantage of the experience of others, and while we may individually contribute our mite to this mass of information, it is the possibility of knowing what everybody else knows that multiplies our educational advantage. Therefore, any organization which has for its object the assimilation and distribution of facts pertaining to a thing common with the experience of others in the same line, not only becomes a powerful factor for individual advantage, but raises the whole standard of educational opportunity to a plane of the highest efficiency. It is when your experience in eliminating the waste time and delay consequent to loading and unloading, can be exchanged for the experience of another relative to the development of motor efficiency, and when this can be exchanged with all others who have made careful study and experiment along other lines, that the greatest results can be attained."

How Electrics Are Used Abroad



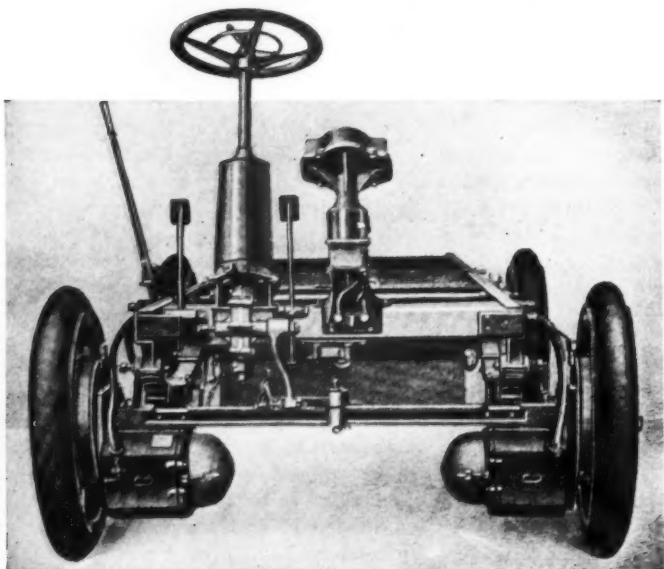
Part of the fleet of thirty 2.5-ton Electro-Daimler wagons put into mail service in Vienna. Chassis were constructed by the Austrian Daimler company. The bodies are of special design and are built by the Imperial Wagon Works, of Austria. Wheelbase of the machines is 130 inches. Two-motor, front wheel drive is used, the two motors giving a maximum of 15 horsepower at 90 volts. Batteries are of the forty-two cell lead type and are rated at 300 ampere hours, giving a mileage of 43.4. Each battery weighs 1,918 pounds



Three-wheeled Torpedo electric, with van body, used in London. The driver is protected by the top and windshield



The Berlin Fire Brigade was using twenty-four electrically-driven vehicles in March of this year. The type illustrated above is one of the powerful machines designed for carrying hose, chemicals, etc., besides a crew of firemen. Note motors for driving front wheels and brakes on front wheels



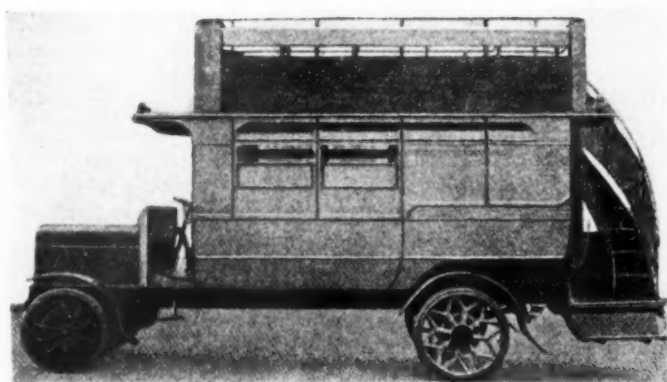
Chassis of Namag electric made in Germany. Note motors for driving front wheels. Also front wheel brakes. The type of control is similar to that employed on gasoline-driven cars



F.R.A.M. 4-ton garbage cart with steel body used in Paris. These trucks weigh about 9 tons and have a speed of 8 miles per hour. The chassis are De Dion-Bouton-Fram products. Batteries are lead and weigh 1 ton each



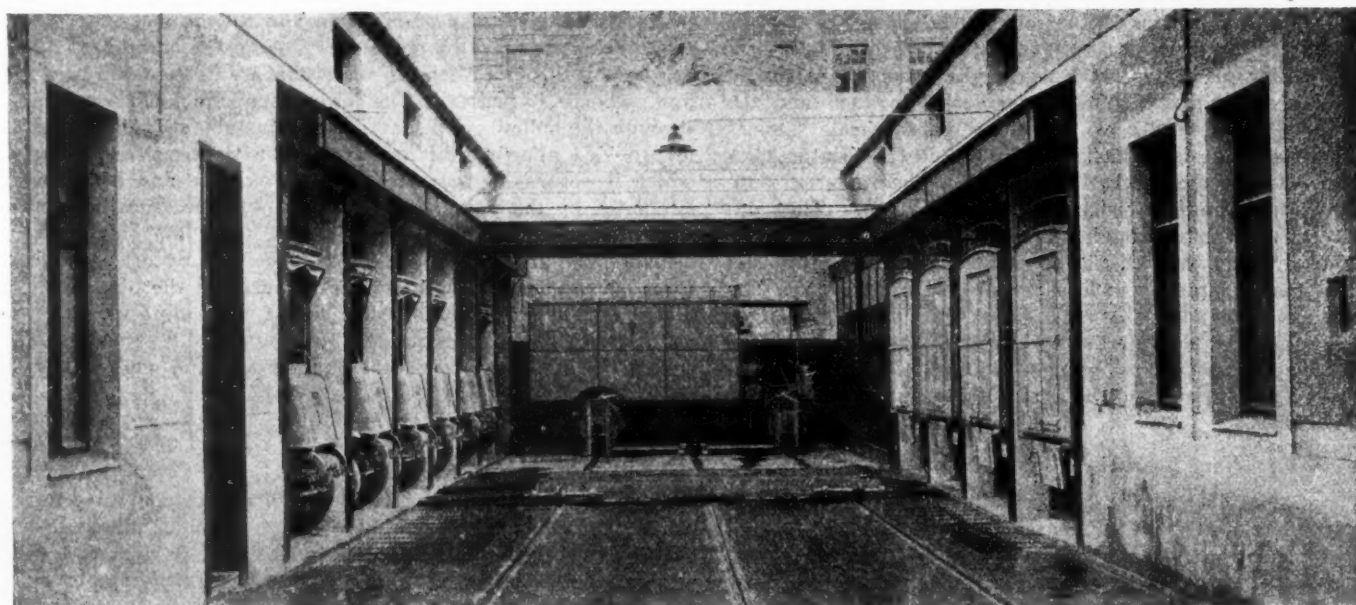
Where the electric mail vans are garaged in Vienna. The building is 131 by 102 feet, of one story and basement, and fronts on three streets. The interior, together with the idea of stalls for the cars, is illustrated below



Cedes gearless electric bus with latest type of London body. There are only a few score electric buses in existence in the various European countries and fleets made up of vehicles of this type are unknown there

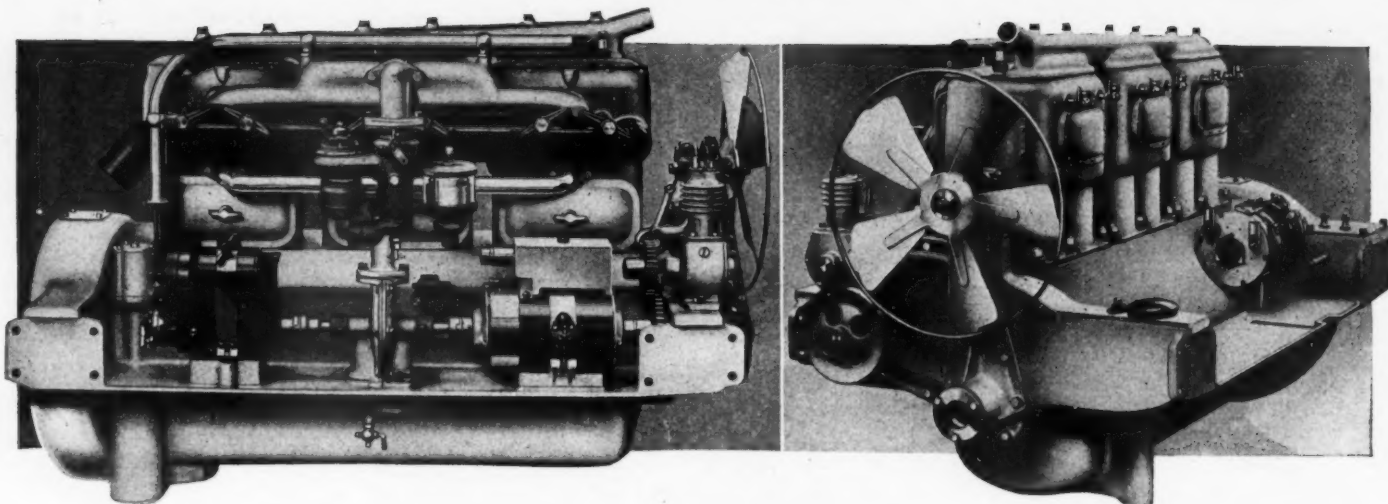


The 3-ton electric used by the Great Berlin Tramways for repair work. It may be charged from the trolley, as illustrated



Interior view of garage for electric mail wagons in Vienna, showing stalls for the cars, turntable mounted on rails for shunting them to any desired aisle, etc. By an ingenious arrangement, batteries are brought up directly under the vehicles as on an hydraulic lift

Illustrations and data appearing on these pages are from the paper of P. D. Wagoner, entitled European Development of the Electric Vehicle Industry, read at the Convention of the Electric Vehicle Assn. of America in Philadelphia, October 19-21



Left—Right side of motor used in new Winton smaller six, showing high mounting of carburetor. Note electric generator, tire pump and magneto. Right—Left side, showing mounting of starting motor

Winton Brings Out Smaller Six

Cylinders 3.625 by 5.25 Inches—Spiral Bevel
Axle Drive—Electric Starting and Lighting

WINTON has announced another model in addition to model 21. It is known as model 21-A and is a smaller six than the Winton of the past few seasons. While in general design the new car is similar to the larger model which is continued, there are many changes in dimensions throughout giving a lighter vehicle in all particulars.

Model 21, the present Winton, has a 4.5 by 5.5-inch motor, but the new 21-A is 3.625 by 5.25. The S. A. E. rating of model 21 is 48.6 and that of the new car 31.6. The larger Winton sells for \$3,250 and the new one for \$2,285 with a five-passenger body and full equipment. The new car is 2 inches shorter than its running mate, having a wheelbase of 128 inches. The tires are also smaller, being 36 by 4.5 whereas the larger car uses the 37 by 5 size.

The power plant has six L-head cylinders with valves on the left. The valve action is completely inclosed and the crankcase is extended back to include the flywheel. This is a difference in design which is noticeable in the Winton 21-A as in model 21, the flywheel is exposed. The valves are operated from a single camshaft with integral cams. The camshaft is removable through the front end of the crankcase without altering the valve adjustment and is driven by steel spiral gears completely inclosed in an oil-tight housing. The valves are interchangeable in size, but are tungsten steel for the exhaust and carbon steel with nickel-steel heads for intake. The valve springs, plungers and adjustment nuts are covered by steel plates which are detachable by removing hand screws.

Chrome-Vanadium Crankshaft

The crankshaft is of chrome-vanadium steel having a tensile strength of 125,000 pounds to the square inch. It is carried on four plain bearings lined with Parsons white brass. All the bearings are contained in the upper half of the crankcase.

As will be noted from the illustration showing the right side of the motor the carburetor is carried quite high and is

bolted by means of a short elbow against a balanced intake manifold. This new model has the carburetor and magneto on the same side. In the model 21 the carburetor is on the left and the magneto on the right. The installation of the magneto, water pump and generator is along the same horizontal shaft on the right. The mountings for the pump and the two generating instruments, the magneto and generator, are secured by bases built up on a horizontal crankcase flange. The air pump is carried at the forward end of the crankcase on the right side; but, instead of being a four-cylinder model, as in the larger six, is a single cylinder.

Lubrication is by a pressure-feed system in which the oil is circulated by a gear pump located in the crankcase. This pump takes its drive by spiral gears from the camshaft and delivers oil through a lead in the crankcase to the main bearings, whence it passes to the lower connecting-rod bearings through the hollow crankshaft. An adjustable overflow valve is provided allowing oil to pass to the timing gears after which it returns by gravity to the crankcase and is again circulated by the pump. This gives a pure pressure system with the exception that the cylinders, cams and camshaft bearings are fed by the oil which is thrown by centrifugal force off the cranks. Oil grooves are used in the pistons to distribute the oil over the surfaces of the cylinders. The quantity of oil fed is regulated by a bypass. As the motor speeds up less oil is fed through the bypass and more to the motor.

Bosch Dual Ignition

Ignition is by Bosch magneto with battery to supply auxiliary current for starting. The magneto is connected to the driveshaft by an adjustable Oldham coupling placed between the magneto and the water pump. The balance of the electric equipment for lighting and starting is made up of the Bijur two-unit system.

The cooling water is circulated by gear-driven centrifugal pump. To keep the water pure and to prevent corrosion each

surface is plated with an anti-rust coating. The radiator is a honeycomb bolted to the drop frame. The tension on the fan belt is adjustable by a slotted bracket.

The dry-plate disk clutch has eleven disks in all, six attached to the driven shaft and five keyed to the drums driven by the flywheel and the clutch can be removed and replaced without interfering with either the gearbox or the crankcase. Power is transmitted by means of a four-speed selective gearbox with direct drive on third speed and with fourth speed geared above direct. The driveshaft is designed to be practically horizontal under normal load and has a universal joint at each end. The floating rear axle uses a pressed steel housing. The axle shafts, differential gears and bearings may be removed without lifting the wheels from the ground. The differential is a bevel design but the drive from the driveshaft to the large gear wheel is by spiral bevel. The gears and pinions are of nickel steel and throughout the entire rear system is carried upon Timken roller bearings.

Elliott Front Axle

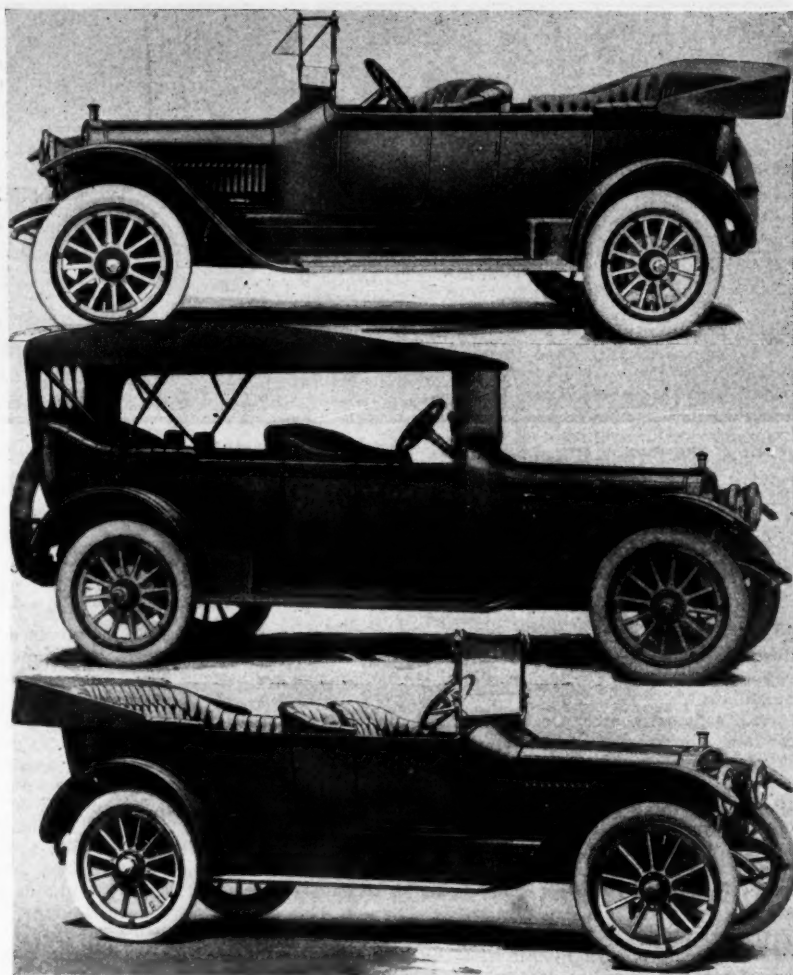
The front axle is an Elliott type drop forging of I-beam section with practically horizontal connection between the steering gear and the left front wheel. Worm and gear mechanism is used to transmit the steering moment from the 18-inch steering wheel. Self-lubricating bushings are provided on the steering column and the steering links are adjustable. The steering arm is over the front axle and two yokes and two adjustable ball joints are provided.

A low center of gravity is secured by a pronounced drop in the frame just forward of the rear axle. The frame is narrowed forward and is constructed without a subframe. Either wood or wire wheels are offered as an option to the purchaser. The Firestone tires are non-skid in the rear as regular equipment.

Five gear reductions are offered as optional. These are 4 1-12, 3 10-13, 3 1-2, 3 4-15 and 3 1-16 to 1. The following table shows the speed of the car in miles per hour on each of the four speeds for three of these reductions:

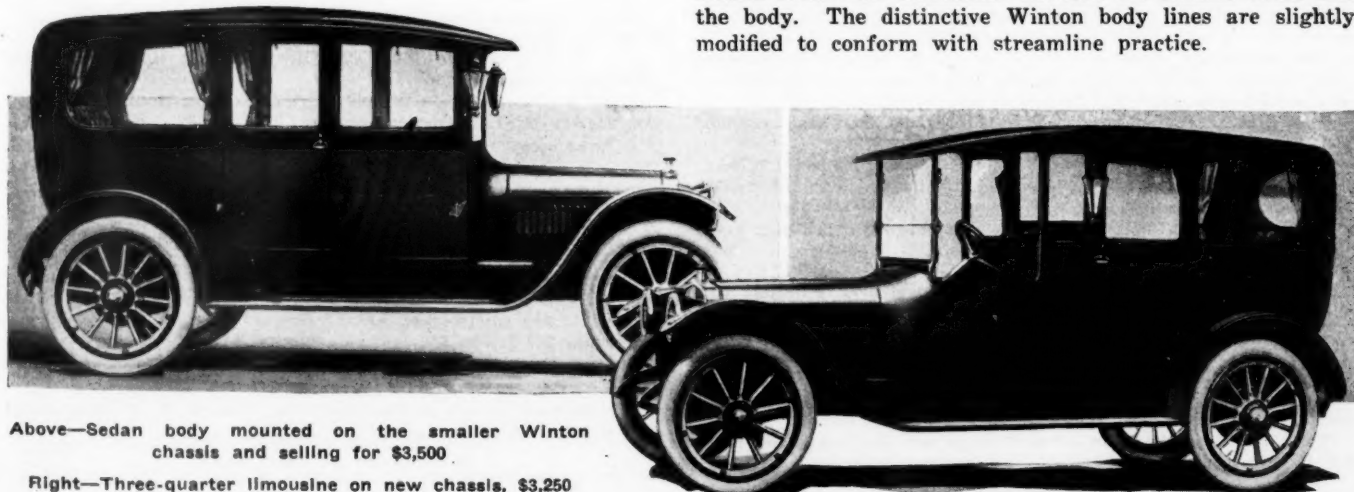
Final reduction	4 1-12 to 1	3 10-13 to 1	3 1-2 to 1
First speed	7.8	8.4	9.1
Second speed	16.0	17.2	18.6
Third speed	25.5	27.6	29.8
Fourth speed	32.4	35.0	37.8

Left drive and center control are used. The horn button is in the center of the steering column. The clutch and brake pedals are adjustable for length.



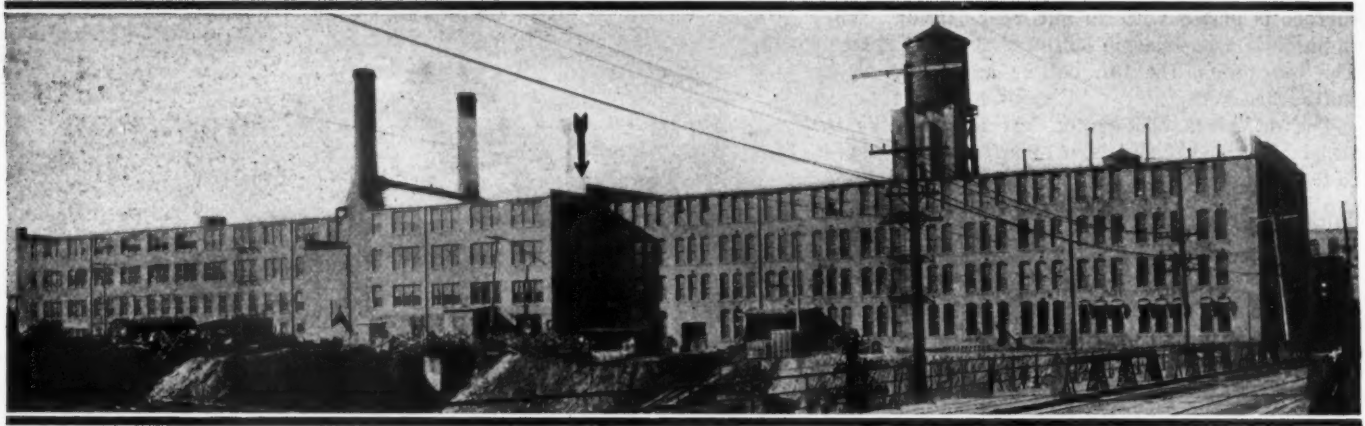
Upper—Five-passenger touring car mounted on Winton larger six-cylinder chassis and selling for \$3,250
Middle—Seven-passenger type on same chassis as above. It lists at \$3,500. Note stream lines and spare tire at rear
Lower—The new smaller six model Winton fitted with a five-passenger body and selling for \$2,285

All the instruments are carried on the cowl board and include the lighting switches, ammeter, carbureter control, primer, speedometer, clock and ignition switches. Over the cowl board is a ventilating, rain-vision windshield. There are no side lights, but dimming lights are carried in the head lamp. All the wires are inclosed in flexible tubing and the wires running from the chassis to the body terminate on a terminal strip secured to the lower side of the fusebox, located on the engine side of the dash. The removal of two screws breaks all connection between the chassis wires and the body. The distinctive Winton body lines are slightly modified to conform with streamline practice.



Above—Sedan body mounted on the smaller Winton chassis and selling for \$3,500

Right—Three-quarter limousine on new chassis, \$3,250



Plant of the Racine Mfg. Co., Racine, Wis., the portion to the left of the arrow being the large addition made this year. The additional floor space amounts to 200,000 square feet. Cost of additions was \$75,000

Car, Truck and Accessory Plants Expand

(Continued from page 1153)

Atlas Drop Forging Co., Lansing, Mich., has occupied an entire new factory of five buildings comprising 50,000 square feet of floor-space at a cost of \$150,000. About \$45,000 was expended for new machines.

The Allegheny Steel Co., Pittsburgh, Pa., has expended \$161,894 for new machinery and equipment.

Allen Auto Equipment Co., New York City. Machinery, \$1,000.

A warehouse and stockroom added to the plant of the American Die & Tool Co., Reading, Pa., increasing its floorspace 2,500 square feet. Machinery, \$10,000.

A complete new factory has been occupied by the American Ever Ready Works, Long Island City, N. Y. The new factory has eight floors each 200 by 300 feet and represents an expenditure of \$1,000,000.

The new factory of the Ashland Mfg. Co., Ashland, O., comprises two buildings, one 50 by 150 and the other 55 by 100 feet. Both are two story frame structures. The company suffered loss to the extent of \$1,200. Machinery, \$3,500.

The Atlas Crucible Steel Co., Dunkirk, N. Y., lost \$50 by fire during the year. Machinery, \$5,000.

A new factory has been occupied by the Automatic Transportation Co., Buffalo, N. Y., two stories in height and 53 by 150 feet and a machine shop of 15,000 square feet has been added at a cost of \$40,000. Machinery, \$10,000.

The Automobile Hospital Co., Cleveland, O., has moved to a new location, a two-story building 30 by 90 being occupied. New machinery worth \$1,000 was installed.

The Automobile Supply Mfg. Co., Brooklyn, N. Y., has expended \$31,000 on new machinery.

The Auto Parts Co., Providence, R. I., has added a new assembly and office building of 12,000 square feet of floorspace at a cost of \$25,000.

The Barth Mfg. Co., Milwaukee, Wis., has spent \$500 for new machinery.

An increase of 100 per cent. in floorspace has been made by the Bijur Motor Lighting Co., Hoboken, N. J., representing 50,000 square feet. Machinery, \$100,000.

The Breeze Carbureter Co., Newark, N. J., has added about 120 square feet at a cost of \$1,500. Machines, \$2,800.

The Brown Co., Syracuse, N. Y., is occupying a new two-story and basement factory 175 by 60 feet, has \$5,000 on new machinery and is adding more.

The Brown-Lipe-Chapin Co., Syracuse, N. Y., has expended \$60,000 on new machinery.

The Central Brass & Fixture Co., Springfield, O., has increased its manufacturing space 4,000 square feet at a cost of \$1,000. Machinery, \$500.

A four-story addition comprising 45,000 square feet has been made by the Champion Spark Plug Co., Toledo, O. The addition cost \$60,000. Machines, \$100,000.

By the purchase of adjoining factory the George P. Clark Co., Windsor Locks, Conn., has added 11,000 square feet to its floor space and added machine equipment worth \$6,000.

Large additions have been made by the Continental Motor Mfg. Co., Detroit, Mich., comprising a machine-shop, test room, hardening plant, stamping dept., stockroom and garage, totaling \$75,000 square feet. The additions cost \$50,000. Machinery \$150,000.

The Davis Mfg. Co., Milwaukee, Wis., is now building a new plant 290 by 250 feet.

About \$500 has been invested by the Dayton Body Co., Dayton, O., for new machines.

Dayton Rubber Mfg. Co., Dayton, O., has added new machinery worth \$25,000.

The Detroit Gear Machine Co., Detroit, Mich., has added 10,000 square feet of floorspace at a cost of \$17,000. Up to November 1, the company spent \$16,000 for new machinery.

Detroit Leather Works, Detroit, Mich., spent \$600 for new machines.

Diamond Chain Mfg. Co., Indianapolis, Ind., added machinery worth \$100,000 during the year.

Two additions totaling \$10,000 square feet were added by Edmunds & Jones Mfg. Co., Detroit, Mich., at a cost of \$25,000. The company has partially occupied a new factory, one building being 35 by 120 and one 50 by 125 feet. Machinery, \$7,500.

Essex Storage Battery & Supply Co., Newark, N. J., has added 1,100 square feet at a cost of \$2,800. Equipment, \$2,800.

The Esterline Co., Indianapolis, Ind., has purchased machinery worth \$3,500.

A finished stockroom of 4,800 feet has been added by the Falls Machine Co., Sheboygan Falls, Mich.

The Federal Rubber Mfg. Co., Cudahy, Wis., near Milwaukee, gave orders for new factory buildings to cost over \$500,000 in July. When completed, these additions will mean an increase of 150,000 square feet, making the total floorspace of the company 450,000.

Fuller & Sons Mfg. Co., Kalamazoo, Mich., have spent \$1,000 for new machinery.

G. & A. Carbureter Co., New York City, has spent \$1,800 for new machinery.

A large wing of 1,500 square feet has been added by the Garage Equipment Mfg. Co., Milwaukee, Wis., to provide more office, storage and manufacturing space at a cost of \$5,000. Machinery, \$10,000.

Quarters containing 2,000 square feet of floorspace have been rented by the Gleason-Peters Air Pump Co., Brooklyn, N. Y. Machinery, \$1,500.

New machinery worth \$400,000 has been added by the Goodyear Tire Co., Akron, O.

Gray & Davis, Inc., Boston, Mass., expended \$120,000 on additional machine equipment for its new factory.

The Emil Grossman Mfg. Co., Brooklyn, N. Y., has invested \$5,000 in new equipment.

About \$5,000 has been expended by the Guide Motor Lamp Mfg. Co., Cleveland, O., on new machinery.

A third story has been added by the Gurney Ball Bearing Co., Jamestown, New York. The additional space thus obtained is 6,000 square feet at an expense of about \$10,000.

A two-story addition 150 by 50 feet containing 7,500 square feet of floorspace has been made by the L. P. Halladay Co., Streator, Ill., \$12,000. New machinery, \$10,000.

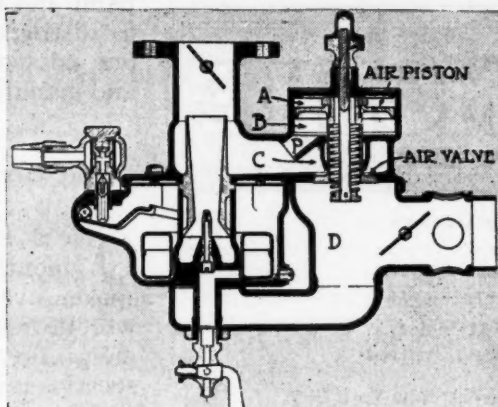
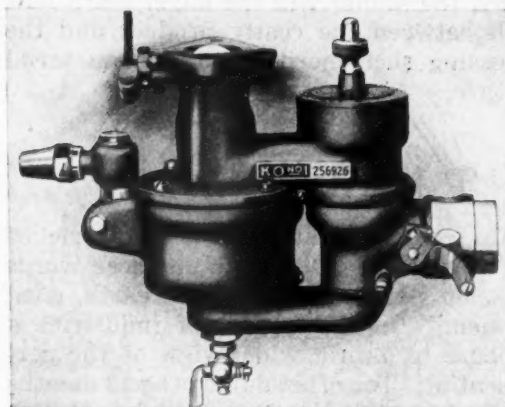
Haynes Mfg. Co., Detroit, Mich., has spent \$10,000 on machinery.

Heissler Storage Battery Co., Chicago, Ill., is occupying a new factory, 25,000 square feet, an increase of 10,000. The investment represents \$30,000 to \$50,000. Machinery, \$15,000.

An investment of \$5,600 has been made by the Hess-Spring and Axle Co., Carthage, O.

The Hilliard Clutch & Machinery Co., Elmira, N. Y., has added \$500 worth of new machinery.

(Continued on page 1183)



Left—Exterior of new Stromberg, known as the KO. Right—Section showing balanced valve construction

Balanced Valve On New Stromberg

Takes Place of Auxiliary Air Valve—
Only One Nozzle and One
Air Opening

A NEW carburetor which differs radically from former Stromberg designs in that the auxiliary air valve is displaced by a balanced valve has just been announced. The new instrument has one nozzle and one air inlet.

The features of the new Stromberg, are the balanced air valve, which if its action were not known, would be referred to as an auxiliary air valve, and the method of using the air, which is taken through this valve in such a way as to give, with a single nozzle, the gasoline flow previously obtained with separate low speed and high-speed nozzles. Briefly, the balanced valve in operation diverts a portion of the air flow taken through the main inlet and this diverted air passes through the carburetor body to a point at the upper end of the venturi tube. The air passage at this point is formed like the entrance of a larger venturi tube and acts in such a way as to cause the air which has entered through the balanced valve to exert additional suction in the primary venturi tube. This additional suction and the added gasoline feed are in proportion to the auxiliary air admitted, so that while there is only one nozzle and one air inlet there are really two air currents exerting a compound action on the gasoline jet.

There is a small passage P which connects the chamber

B with C. The chamber A above the piston always contains air under atmospheric pressure except when the dash control valve or air intake shutter is used, because of its communication with the chamber D through the space around the spring and up through the sleeve of the valve.

The vacuum B is substantially the same as that in C which is, of course, determined by the demand of the motor and the strength of the air valve spring. A

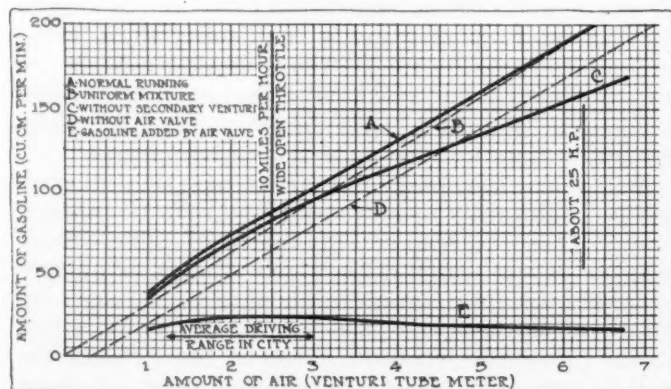
light spring is used so that this vacuum is always very small, perhaps 8 ounces. As a result the air valve tends to move upward by difference in pressure between C and D, while the piston tends to move downward by the difference in pressure between A and B. As the piston is approximately twice the area of the valve, the whole valve opens downward but the balance between the chambers is such that the pulsations of motor suction are deadened and the valve flutter thus eliminated.

When the carburetor is in action and the engine running idle, the valve is slightly off its seat. The single nozzle feeds the gasoline and the primary venturi supplies nearly all the air. As the engine speed is increased or the throttle opened, a greater demand is made on the air valve, which opens, admitting additional air. When this air reaches the top of the venturi it increases the suction in the venturi and draws additional fuel, so that the supply taken is in proportion to the amount of air which passed through the valve. In other words, as the air valve opens there is an increase in the supply of gasoline as well as the air sent to the motor, thus the result obtained is like that given by a carburetor with two fuel nozzles and two air inlets.

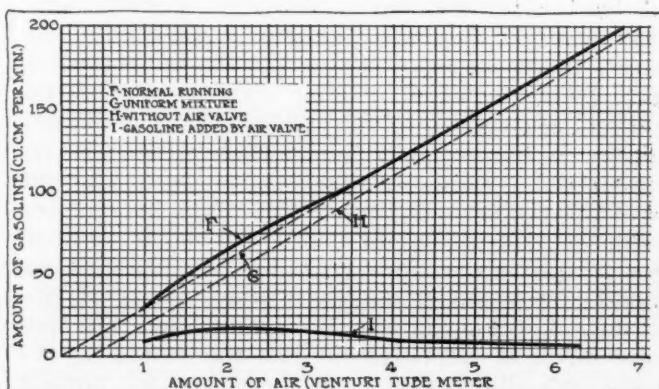
The balanced valve does not flutter, but operates gradually as the pressures vary. At low engine speeds the position of the valve regulates the mixture, but above 25 miles an hour, according to the Stromberg engineers, the valve may be opened all the way without noticeably affecting the running of the engine except to admit a slightly greater charge.

In practice all hot air is used, taken from a tube connecting with a housing surrounding a portion of the exhaust manifold.

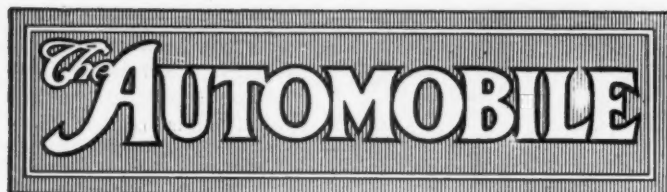
LOS ANGELES, CAL., Dec. 5—Fourteen Beardsley electric's participated today in the Beardsley Electric Owners' Tour from this city to Orange, Cal. The winner averaged 112.1 miles on a single charge. The average mileage for all the cars participating in the run was 100.1 miles.



Characteristics of type K carburetor showing practically constant ratio of gasoline to air at all rates of air flow



In producing these curves a spring which deflected .5 inch under 1 pound load as against .267 inch in the first set, was used



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The Inner Circle

THREE years ago many of the semi-optimists declared that the days of shows were at an end, that novelty in automobiles had almost ceased, that the eventual while not actually arrived was close at hand excepting for the minor alterations which were sure to follow from time to time. Were those theorists here today and confronted with the many changes that are to be seen at the opening of the Grand Central Palace show their logic would have to be entirely revised, and the conclusion drawn that today we seem to be more than ever on the threshold of a great wave of efficiency reform, improvement not by the brute-strength policy of getting more horsepower by adding to the bore and stroke of the motor, more horsepower by lighter reciprocating parts, by more efficient cooling, more regular expansion and contraction of the cylinder walls, by better balance of the crankshaft and connecting-rods, by more rigidity in the crankshaft, by more efficient valve timing, by improved piston rings, by a better system of lubricating the motor—in short, we have need for shows for many years hence. These shows should aim to bring out these finer points of improvement, the buyer should be conducted into this inner circle of improvement and the sooner he realizes that all matters of car cost are not merely questions of wheelbase, tire sizes, motor dimensions,

paint and lines, the sooner will the buyer learn how to distinguish between the costly product and the one not possessing such merits of design, material and manufacture.

The Day

ONCE again returns that day in the cycle of months when all should pause on those words spoken over 1,900 years ago, "Peace on earth, good will toward men." In the busiest of industries a momentary pause to gain a wider view of the perspective is essential. Too often during the 12 months we have dug a seemingly endless trench along which we travel, its objective is our business goal, its sides so high that we have lost the view of other endeavors. Our selfishness has increased, our eyes behold but one objective. If for only one day we can get out of our trench, our rut, see the zones in which others operate, see the goals for which others are striving, see the motives that are stimulating others' activities, see the possibilities of other lines of endeavor, see the humanities of our fellow man, then we can go back to our own work with a renewed vim, with a broader vision, with a higher objective, with a more human atmosphere surrounding us.

Used-Car Markets

AIMING to establish a national used-car market report to be issued once every 3 months, a plan already announced by the Chicago Automobile Trade Association, is a very worthy object. The evils of the used, or second-hand, cars have been with us for many years, numerous plans for their solution have been evolved, but this organization is the only one that appears to be operating along feasible lines. Its endeavors do not divulge any of the business secrets of any dealer contributing to the work. The price lists quoted on used cars are based on actual sales, not on appraised values set by committees but on real sales made by dealers. This is the major attraction of the scheme. This gives it reality, not an imaginary value. What Chicago has done other cities should co-operate in and make the national market report a reality. These reports are solely for the dealer and it depends on the dealer as to whether they will eventually be a national success. Every manufacturer should lend his aid to induce his dealers to co-operate in furnishing these used-car values from his zone. These market reports are as essential to the automobile dealer as the metal markets to the metal buyer, or the cotton quotations or grain quotations to their respective buyers.

For years the used-car market has been a mart where uncertainty was the only factor to be counted upon. There were no real standards of value—there was no way in which dealers, car makers or owners could tell the approximate value of any used car. By means of the national used-car reports to be issued by the Chicago association, however, these conditions will be remedied, order will be brought out of chaos and the trade will profit correspondingly.

U. S. Output 515,000 1914 Cars, \$485,000,000

According to Chamber of Commerce—Trade Conditions Excellent—Ninety-Three Plants Reported On

NEW YORK CITY, Dec. 19—According to General Manager Alfred Reeves of the National Automobile Chamber of Commerce, over 515,000 cars have been manufactured in the United States during the past 12 months, the wholesale value of these being given as over \$485,000,000. These figures place this country far in advance of the balance of the world in automobile and motor truck production.

Mr. Reeves returned yesterday from a western trip which completed travel that during the past 7 months took him to all the factories of the ninety-three members of the chamber. His round of the plants included forty-two cities in eleven different states, from Massachusetts and Virginia in the east to Wisconsin and Missouri in the west.

Trade Conditions Excellent

"Trade throughout the country has been excellent, considering conditions," said Mr. Reeves, "and the makers, as a class, are in good shape. They have lost the export trade in passenger cars to a large degree, but of course, truck figures have increased as a result of the war.

"My visits to the ninety-three plants and conferences with the leading men in the industry," continued Mr. Reeves, "indicate that the present position of the automobile trade has been attained only by concentrated efforts on the part of great engineers and industrial leaders who could forecast the future, and who co-operated through the N. A. C. C. with a view of attaining, in the quickest possible way, the present enviable condition. Combined with this was scientific manufacturing by men schooled in economy, who had efficiency for the keynote in every department of their plants. As a result, greater values than ever before are being offered, and the former sheds that were used for factories have been supplanted by wonderful structures of cement, steel and glass, equipped with the most modern machinery.

"In my rounds, I was forcibly impressed with the readiness of car makers to supply every demand of the public. There is no inclination to force special types, and it is this that has hastened the increased buying of automobiles. Our makers supply cars small or large; low powered or high powered and seating two or seven passengers. They supply cars that are dreams of luxury and others that are mainly for utility. They have been willing to furnish anything from one to eight cylinders, and with conveniences undreamed of a few years ago.

"Prices would appear to be almost at the minimum point, provided quality is to be maintained, materials and labor, which is incidentally 47 per cent. of the list price of the car, are most important in any manufactured article, and if skilled making and good materials are to continue in use, there would appear to be small chance of any lower prices for cars of the present type. It is worth noting that the high priced cars continue in constant demand, although of course the greatest increases have been made in the moderate priced cars that approach within the buying range of an increasing number of people."

Fenders on Chicago Motor Trucks by March 1

CHICAGO, ILL., Dec. 19—Provided a practical device is discovered in a series of tests to be started immediately after Christmas, all motor trucks operating in the city of Chicago must be equipped with fenders on and after March 1, 1915.

This was the bomb exploded in the ranks of the commercial car dealers and users by the city council and police this week. It is an old bomb with a new fuse. Already there is one ordinance, passed in June, 1913, and providing for the carrying of fenders on motor trucks, on the statute books, but it never has been enforced for the reason that it does not stipulate what kind of device shall be carried. The new ordinance, which was passed in October, but which was published for the first time this week, is an amendment to the old one and provides for the holding of a series of tests to determine upon a practical device.

The tests, which will be held under the second deputy superintendent of police, will be made of all designs submitted before December 24. Three plans already have been received. If other plans are received after the holidays, another series of tests will be conducted the first of the new year.

The tests will be made upon three dummies, representing a man, a boy and a child, in various attitudes and at speeds of 3, 7 and 15 miles an hour for use on trucks of 1-ton capacity and greater. The standard size of fender for use on commercial vehicles of 1-ton capacity or more must be attached to a standard truck of 3-tons capacity. A smaller sized fender, if submitted, must be attached to a motor vehicle of less than 1-ton capacity, not of the cyclecar or motorcycle type.

The fender to be approved must comply with several general specifications. According to the ordinance, the length, width and height of the fender shall be of a minimum consistent with the desired protection and at the same time not impede traffic, it shall have resiliency, be adaptable to varying road conditions, be reliable in operation and efficient of mechanism, shall interfere as little as possible with the operation of the truck, be neat in design and appearance and of a reasonable cost so as not to impose unnecessary hardship upon the owners of commercial vehicles.

If the ordinance is enforced, it will affect the owners of 1,911 trucks of 1-ton capacity or over.

A meeting of truck dealers and users has been called by the Chicago Automobile Trade Assn. for Tuesday noon, when the ordinance will be discussed.

Freight Increase Covers Cars and Parts

NEW YORK CITY, Dec. 21—The 5 per cent. freight rate increase asked by the railroads in Official Classification territory was granted last Friday, December 18, by the Interstate Commerce Commission. There were some exceptions, including coal, iron ore and lake-and-rail rates, but motor cars, parts and accessories are covered by the increase.

Official Classification territory is practically that east of the Mississippi river and north of the Ohio and Potomac rivers. Central Freight Assn. territory is that part of Official Classification territory west of Buffalo.

When the first decision was handed down granting a partial increase and applying it to Central Freight Assn. territory it did not affect through rates between points in the territory and points outside; the same rule applies to the latest decision; for example, rates between Boston and San Francisco will not be affected if they are through rates, but if the rate is local to the Mississippi the 5 per cent. increase will apply to the eastern half of the rate.

Shipments by rail between New York and Buffalo and thence by boat to Detroit will not be affected under the lake-and-rail exception, but all-rail shipments between New York and Detroit will be covered by the increase.

The rates are to go into effect 10 days after their publication by the railroad companies; the latter are working out their tariffs now, but those familiar with this task state that it may be February 1 or March 1 before the increases can be made to apply.

NEW YORK CITY, Dec. 18—The Electric Storage Battery Co., Philadelphia, Pa., has declared the usual quarterly dividend of 1 per cent. each on its common and preferred stocks, payable January 2 to holders of record December 21.

California State Speed Law Supreme

SAN FRANCISCO, CAL., Dec. 15—As a result of the recent decision of the Appellate Court of the Third District of California, that state is one of the first in the United States in which a uniform speed law for motor vehicles exists. The ruling of the court, which is a final decision, holds that the present state motor vehicle act supersedes municipal ordinances covering the same subject, and towns and cities cannot enforce any local regulations.

Hub Dealers Win Separator Fight

But Must Minimize Fire Risk
or Separators Will Be Required
—U. S. Tests Armored Trucks

BOSTON, MASS., Dec. 19—The Boston automobile dealers and proprietors of garages have won their fight against the adoption of separators in all their places of business as proposed under the new fire hazard law, and outlined by John A. O'Keefe, the commissioner in charge of that work. The results are now dependent upon the men operating such places to see that they run their places so as to minimize the hazard, or separators will be ordered installed. When the matter was first broached Commissioner O'Keefe gave a hearing to the motor interests after which he put it up to them to form a committee to cooperate with him and furnish suggestions.

President J. S. Hathaway of the Massachusetts Garage Assn. appointed a committee, to go over the matter and to formulate regulations. Blanks containing thirty questions were sent to 250 garage and service stations in Greater Boston. These were filled out by 121 owners, and then the data were carefully compiled. Then suggestions were evolved, and submitted to President Hathaway. He had a conference with Mr. O'Keefe and submitted them to him. They were as follows:

We would suggest that when any person purchases gasoline in small quantities from a garage, to be used outside a garage, that a record be kept of the name and address of said purchaser.

Make it unlawful to use gasoline for any other purpose in garages than the filling of tanks in automobiles.

No gasoline to be used by industrial institutions, tailors, cleansing establishments, dyers, etc., without special permit from the fire commissioner, and a record to be kept showing in what manner gasoline is disposed of.

Upon investigation we find that there is more danger from gasoline used by industrial institutions, cleansing establishments, etc., than from that used by garages.

A printed card, approved by the commissioner, should be placed upon the floor of every garage, public and private, stating that the use of gasoline other than for motors is prohibited. This card to be signed by the fire commissioner.

If clause 66 of the laws and regulations governing such fluids is enforced there will be no need of installing a separator, in our opinion.

Garages to be supplied with a complete set of these laws and regulations regarding the use of gasoline, etc.

We would suggest that a law be put into effect to prohibit the storage of gasoline in garages other than that kept in the tanks of automobiles, storage tanks and portable tanks.

The storage of gasoline in cans to be kept in a vault outside the garage building, same distance required for gasoline tanks. This vault to be kept locked except when in use.

Rules by January 15

Commissioner O'Keefe intends to promulgate a set of regulations to go into effect on January 15 covering this matter. These rules have not been fully determined yet, but the Commissioner told THE AUTOMOBILE correspondent today that he had decided not to insist upon separators.

"I have framed one rule to provide that if upon examination following the recommendation of Fire Department chiefs, it is found that any garage owner is allowing gasoline to go into a sewer that proprietor will be obliged to put in a separator at once. There will be allowed without special permits a portable tank containing 55 gallons in the garage. Also one can containing one gallon of gasoline. The proprietor may use a tank buried under the building if it is piped to the garage; or a tank buried outside the building, or both. Sets of regulations will be provided for every floor. Special permits may be given for a larger amount of gasoline than that provided above, but in rare cases only, and when its need is really proven. There is to be a special public meeting called to go over the matter at which all interested, including fire department heads, will be present to consider the whole subject. After the regulations are put into effect inspectors will visit garages to note if the law is being ob-

served, and those who do not live up to it will have to install separators or their license to do business will be revoked. By impressing upon every one that more care should be used, such as obeying the 'No Smoking' signs, and having the motor stopped when the tanks in cars are being filled, together with observing our regulations, I believe the danger will be minimized to a great extent."

244 White Trucks Go to Russia

CLEVELAND, O., Dec. 21—A train-load of seventy freight cars loaded with 244 motor trucks was shipped by the White Co., Saturday, destined for the Russian army; the equipment was made up of different truck capacities, the sale being made direct through the White dealer at Petrograd. This shipment is to go to New York, thence by steamer through the Panama Canal, and across the Pacific to Vladivostok, and thence over the Trans-Siberian railroad to Petrograd. Col. J. Baldwin, the special commissioner of the Russian Imperial government, is in Cleveland, and has placed an additional order with the White Co., for 200 trucks. According to Col. Baldwin, future shipments will be sent via the Panama Canal in preference to the Archangel route, it being deemed safer from molestation by the German navy, and also because since the Russian-Japanese war the Russian government has kept a steamer route to Vladivostok open by the use of enormous ice crushers for practically the entire winter season.

Government Experiments with Armored Cars

WASHINGTON, D. C., Dec. 19—Some experiments are being conducted by the army ordnance department with improvised armored motor cars. These were obtained by purchase of motor chassis of the four-wheel-drive type, on which is being installed armor plate of a thickness and character similar to the shields of field artillery guns. It is estimated that such a car with armor will cost about \$5,000.

Anderson Goes from Chalmers to Hupp

DETROIT, MICH., Dec. 21—Lee Anderson, well known in the industry and connected with the Chalmers Motor Co.'s advertising department for 5 years, has resigned to become advertising manager of the Hupp Motor Car Co. He succeeds Frank Mooney, who recently resigned. Anderson takes up his new duties January 1.

250 Owen Cars with Entz Gearset for 1915

NEW YORK CITY, Dec. 21—R. M. Owen & Co., 142nd street and Fifth avenue, this city, has secured a factory of 50,000 square feet at this address and has begun the manufacture of 250 Owen cars with the Entz electric gearset for 1915. In the new factory the electric gearset will be manufactured in its entirety and the assembly of the remainder of the chassis carried out. The Owen company is owned outright by R. M. Owen who was sales agent for Reo and Premier for several years, Stoughton A. Fletcher, banker of Indianapolis, and who is now heavily interested in numerous motor car businesses, together with R. A. Rainey of the large coke industry in Pennsylvania.

The new car as a touring model will list at \$3,700 and as a three-passenger roadster at the same price. Production is already well under way, the first lot of ten cars being nearly completed. A six-cylinder motor 3 3-4 by 5 will be used, together with American Ball Bearing Co. axles, and Houk wheels.

By using the Entz type of electric gearset the conventional clutch and gearset are eliminated and with them go the magneto, electric motor starter and electric generator, the units of the electric gearset supplying all of these parts. The striped chassis weighs 3,150 pounds. The wheelbase is 136 inches, tires 35 by 5 and flat semi-elliptic springs are used in front and rear. Only a small Willard starting battery is carried.

In the electric gearset are two units, one called a clutch generator and the other a conventional electric motor. The clutch generator takes the place of the flywheel and performs two functions, first that of an electric clutch and second a generator of electricity. The second unit is an electric motor which is mounted back of the clutch generator. This electric motor uses current generated by the clutch generator and helps the gasoline motor to drive the car. There is a mechanical reverse.

Report Favors Federal Roads

Congressional Committee Advises That Comprehensive Plan for Road Building Is Urgent

WASHINGTON, D. C., Dec. 19—Within the next few days the joint congressional committee on federal aid for good roads will issue a voluminous report in which will be set forth the fact that incalculable advantages will accrue to the United States from the construction of a system of model highways throughout the country. The report is now before the committee for approval and the correspondent of THE AUTOMOBILE has been privileged to make certain excerpts from it of interest to motorists.

It is an interesting fact that the committee in this report has refrained from recommending any specific plan of action, although it had before it numerous proposals, which included former Senator Bourne's bill providing for an issue of 50 years' bonds aggregating \$500,000,000.

Of particular interest in the report are the conclusions arrived at by the committee and some of these are as follows:

Congress should proceed at once to devise a broad, comprehensive plan for federal aid to the building of model roads.

The supervision of the government's highway building activities should be intrusted to a congressional commission, not an administrative bureau.

Care should be exercised that federal aid be scientific and effective and not degenerate into a "pork barrel" raid on the national treasury.

First class roads in this country would reduce the cost of living, improve business and ameliorate educational and social conditions in rural communities.

More than \$10,000 and 2 years' time has been devoted to

a comprehensive study of the good roads problem and a vast amount of information has been collected in this country and in Europe. The committee's report expresses the opinion that federal aid to state road building once undertaken never will be abandoned and therefore should be entered upon only after the most exhaustive study of the problem.

Denver Club Inaugurates New License Plan

DENVER, COLO., Dec. 20—Motor car owners belonging to the Denver Motor Club are being saved a great deal of time and inconvenience by a plan the club has inaugurated to secure the 1915 state licenses for all its Denver members. Official application blanks have been mailed to the 1,100 members living in the city and county of Denver. They can fill out these blanks at home, bring them to the club's headquarters, have the required notary work done in a few minutes and then let the club obtain a large number of licenses at one trip to the office of the secretary of state.

12 Miles an Hour Maximum Speed in Omaha

OMAHA, NEB., Dec. 19—Omaha is now lining up with the rest of the big cities in the United States in regard to proper traffic laws. A new traffic code became effective Thursday requiring lights on all vehicles, whether motor-driven or otherwise, and extends the district wherein 12 miles per hour is the maximum speed. An ordinance requiring that the driver of every motor-driven vehicle, whether he be the owner of a limousine or the chauffeur of a taxicab, to take out a chauffeur's license has also been introduced to the city commission and will soon be passed on. With the license will go one of the metal tags.

Ten Exhibits for Salon

NEW YORK CITY, Dec. 21—France, England, Italy and the United States are represented by the ten exhibitors who have already taken space for the importers' automobile salon to be held at the Astor Hotel January 2 to 9. The exhibitors who have already taken space are the representatives in this country of De Dion-Bouton, Fiat, Isotta-Fraschini, Lancia, Renault, Rolls-Royce, Simplex, Sheffield-Simplex, Holbrook Co. and Brewster & Co.

\$700 Yearly Upkeep Per Mile Is Not Excessive for Macadam Roads

NEW YORK CITY, Dec. 19—Well-constructed gravel roads will sometimes sustain years of traffic without showing marked deterioration, even when there has been no maintenance. Such roads sometimes even improve during the second season; more frequently, however, they show ruts or the formation of chuck holes. It can not be expected that the average life of a gravel surface will be greater than that of a macadam surface. The average interval for resurfacing macadam roads is between 6 and 7 years. If a sum equal to two-thirds of the original cost of the gravel surface itself is provided for renewals at 6-year intervals, it should be estimated at from \$150 to \$250 per mile per year. If \$30 is then allowed for annual dragging and small repairs, the total annual cost of repair and maintenance of gravel roads would be from \$180 to \$280 per mile. The annual cost of strict maintenance is sometimes below \$30. In Bennington County, Vt., during 1912, 175 miles of gravel roads were maintained at a cost of \$20.70 per mile. The annual cost of maintenance and repair on sand-clay roads, including all necessary resurfacing at periodic intervals, should not be fixed at less than 10 per cent. of the original cost.

The cost of repair and maintenance of water-bound macadam roads has been determined with some considerable exactness from Massachusetts figures and

checked by resurfacing charges in other states and in Germany. From \$100 to \$125 per year ordinarily pays for necessary small repairs, such as patching, cleaning culverts, etc., and from \$400 to \$425 per year is the necessary annual charge for resurfacing at periods varying from 6 to 7 years. The sum of \$525 per mile, on an average, should therefore absolutely maintain macadam roads if changes and increases of traffic are not excessive. It must be understood, however, that in many instances where macadam sufficed for the volume and character of traffic prior to 1906, it will not withstand the action of the motor vehicle traffic, which has developed since that time.

Many miles of ordinary or water-bound macadam road have been resurfaced with bituminous materials and many miles of new bituminous-macadam road have been constructed. The logical maintenance of such highways is a surface treatment with bituminous material and rock screenings, clean gravel, or sharp sand. The cost of such surface treatment is from 4 to 12 cents per square yard, and it may be expected to last from 1 to 3 years, according to the density of traffic and the success of the application. Theoretically, perfect surface treatment would constitute absolute maintenance for a bituminous-macadam road. Such maintenance is seldom or never realized

and bituminous-macadam roads doubtless require resurfacing at intervals. The cost of such resurfacing is not yet known.

The average cost for repair and maintenance of 7,300 miles of highway in Connecticut, Massachusetts, New York, New Jersey, and Rhode Island for the year 1912 was about \$800 per mile. A large part of this money was expended for bituminous resurfacing and bituminous surface treatment. There is some question whether the expenditure correctly measures the average cost of repairing and maintaining bituminous-macadam roads. In the State of New York, however, for the years 1911 and 1912 the average cost for repair and maintenance was \$724 per mile upon a total average of 2,861 miles. The annual cost of repair and maintenance on Massachusetts state roads for the years 1910, 1911, and 1912 was, respectively, \$642, \$647, and \$676 per mile for about 850 miles. For the most part these figures for New York and Massachusetts represent the cost per mile of resurfacing with bituminous material and of maintaining bituminous-macadam and water-bound macadam roads by surface treatment with bituminous material. It is clear, therefore, that \$700 per mile is not an excessive estimate at present for the annual cost of all repair and maintenance of bituminous-macadam roads.

Wisconsin Buys 18,000 Cars

**Business Divided Among 1,202 Dealers,
Average 15 Cars Per
Dealer**

MILWAUKEE, WIS., Dec. 22—A most gratifying trade situation in Wisconsin for the year 1914 is reflected by the comparative report of registrations of motor cars in private hands for the last 3 years, compiled for THE AUTOMOBILE by the motor registry division of the secretary of state's department. There were registered in Wisconsin this year 18,515 more privately-owned cars than in 1913, indicating that approximately 18,000 new cars were distributed in this state during the annual period now closing. The business was divided among 1,202 dealers, who sold on the average of 15 cars each. In 1913 the figures indicate a sale of 10,068 new cars for the year, distributed among 1,393 dealers.

The comparative statistics follow:

	1912	1913	1914
Automobiles at \$5 each.....	\$24,578	\$34,646	\$53,161
Motorcycles at \$2 each.....	4,060	6,120	7,880
Dealers at \$10 each.....	1,052	1,393	1,202
Total revenue	\$136,270	\$199,400	\$293,585

The fact that Wisconsin assimilated more than 18,515 cars in a year that probably will go down as one of the worst, industrially, in American history, leads to the belief that this state can take care of at least 25,000 and possibly more cars during 1915, which is expected to be a boom year. It is figured that only 6,500 of the 18,515 cars purchased in 1914 were Fords. The population of Wisconsin is figured today at 3,000,000, and the 1914 registration shows that there is a car for every 60 persons in this state. The most important tradesmen are of the opinion that until the ratio contracts to one car to every 25 of population, their market is an attractive one. Thus there seems to be no reason why 1915 should not be the best year in motor history.

Wisconsin registration figures are reliable as a basis for figuring the number of new cars absorbed by the state for the reason that Badger licenses are annual and owners must apply for new licenses at the close of each year, for issue on January 1 of the succeeding year. Owners who dispose of a car may transfer the old license to the new for 50 cents and the purchaser must take out a new license at \$5, so that such transfers do not alter the figures and the yearly gain actually represents the number of new cars purchased during the year.

The decrease in the number of dealers for 1914 compared with the previous year is taken to mean that the business of selling cars is becoming more stable and a matter of the survival of the fittest. The number of agents is 191 less than in 1913. This number probably represents the host of so-called curbstome dealers who are gradually being driven out of business or driven into legitimate agency business.

It will be seen from the report that Wisconsin motorists pay a tribute of approximately \$300,000 per annum for the privilege of driving their cars over the public streets and highways. Private owners pay \$5 per car; motorcyclists \$2, and dealers \$10. The private owner stands the greatest share of the burden, or \$266,000. The manner of distributing the revenue, however, removes the pain of the sting. After the cost of administration is deducted, the net revenue is transferred into the highway funds of state and county. The state aid fund receives 25 per cent. of the net revenue, while 75 per cent. is turned back into the highway funds of the counties according to the amount paid in from each county for licenses.

N. Y. Registrations Gain in Value \$354,411.59

NEW YORK CITY, Dec. 21—Motor registrations in New York up to and including December 15, netted that state a total of \$1,525,855.86, an excess of \$354,411.59 over the same period of last year. So far this year 167,930 automobiles were registered and 66,113 chauffeurs licensed. These figures reveal about 20 per cent. increase in fees, 26 per cent. increase in registrations and 19 per cent. increase in the number of chauffeurs licensed, there being 132,251 motor cars registered and 56,228 chauffeurs licensed in 1913.

Of the total number of motor vehicles registered, 150,678 are pleasure cars, 17,252 commercials and 2,368 owned by non-residents. One of the most notable features shown by the registration figures is that the bulk of cars or 75,042 motor vehicles are less than 25 horsepower; 50,971 less than 35; 19,943 less than 50, while only 1,298 were rated at 50 horsepower or more.

54,600 Licenses Issued in Missouri

ST. LOUIS, Mo., Dec. 18—There have been issued up to December 15, in Missouri, 54,600 licenses. Of this number St. Louis had the greatest number of registrations with 12,004, while 6,749 were issued to residents of Kansas City. For the same period last year St. Louis had 9,789 plates and Kansas City, 5,494. For the entire year of 1913 the registration for the whole state was 38,140.

During the past month, November, ninety-two cars were registered from St. Louis. Thirty-five were Fords.

Hexter Truck Makers Assign

NEW YORK CITY, Dec. 19—The Roland Gas-Electric Vehicle Corp. has assigned for the benefit of its creditors to Clifford G. Ludwigh. This company was formed last November to manufacture a new type of gasoline-electric truck designed by P. K. Hexter. It had a capital of \$200,000. War conditions, it is stated, coupled with the closing of the stock exchange, on which nearly all of the backers operated, interfered with the manufacturing work.

A petition in bankruptcy was filed against the company.

Automobile Securities Quotations

NEW YORK CITY, Dec. 22—A slightly weaker tone was apparent in the automobile securities market during the past week. This was not peculiar to the automobile securities, all other stocks being affected more or less. What declines there were, however, were not important and the market as a whole might be characterized as steady. Some of the week's changes are significant of the general trend. General Motors common was 5 1-2 points below last week while the preferred was slightly ahead. Firestone preferred gained 1. Goodyear and Goodrich stocks were slightly lower. Kelly-Springfield common lost 3 points while the first preferred gained 1 1-2. Maxwell stocks were a little stronger. Stewart-Warner gained 5 on the common and 1 1-2 on the preferred, U. S. Rubber 3 3-4 on the common and 2 on the preferred and White preferred rose 1 point. Willys-Overland common gained 3 points and preferred 4.

	1913		1914	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co. com.....	195	220	250	...
Ajax-Grieb Rubber Co. pfd.....	97	102	100	...
Aluminum Castings pfd.....	98	100	95	100
Chalmers Motor Company com.....	...	94	...	90
Chalmers Motor Company pfd.....	90	95	87 1/2	92 1/2
Firestone Tire & Rubber Co. com.....	235	242	350	360
Firestone Tire & Rubber Co. pfd.....	100	101	110	111
Garford Company pfd.....	78	90	...	...
General Motors Company com.....	35	36 1/2	79	83
General Motors Company pfd.....	75	78	90 1/2	93
B. F. Goodrich Company com.....	16	17	24 1/2	25
B. F. Goodrich Company pfd.....	76	76 1/2	93 1/2	96
Goodyear Tire & Rubber Co. com.....	185	192	188	191
Goodyear Tire & Rubber Co. pfd.....	90	92	100	102
Gray & Davis Inc. pfd.....	94	101	...	...
International Motor Co. com.....	...	5	...	...
International Motor Co. pfd.....	...	15	...	...
Kelly-Springfield Tire Co. com.....	...	...	65	68
Kelly-Springfield Tire Co. 1st pfd.....	...	...	79	80
Kelly-Springfield Tire Co. 2nd pfd.....	...	...	95	97
Lozier Motor Company com.....	...	16	...	...
Lozier Motor Company pfd.....	...	90	...	...
Maxwell Motor Company com.....	2 1/2	3	14 1/2	14 1/2
Maxwell Motor Company 1st pfd.....	18	18 1/2	44	44 1/2
Maxwell Motor Company 2nd pfd.....	6 1/2	7	17 1/2	18
Miller Rubber Company.....	115	121	160	...
Packard Motor Car Co. com.....	...	...	...	100
Packard Motor Car Co. pfd.....	90	95	90	...
Peerless Motor Car Co. com.....	15	25	15	20
Peerless Motor Car Co. pfd.....	75	80	...	55
Pope Manufacturing Co. com.....	1	3	...	...
Pope Manufacturing Co. pfd.....	10	15	...	...
Portage Rubber Co. com.....	...	30	25	30
Portage Rubber Co. pfd.....	...	85	80	85
Reo Motor Truck Company.....	5	7	10 1/2	11 1/2
Reo Motor Car Company.....	13 1/2	14 1/2	21 1/2	22 1/2
Stewart-Warner Speed. Corp. com.....	...	55	52	54
Stewart-Warner Speed. Corp. pfd.....	95	97	98 1/2	101
Studebaker Corporation com.....	17	18	32 1/2	33
Studebaker Corporation pfd.....	65	67 1/2	86 1/2	88
Swinehart Tire & Rubber Co.....	65	70	69	71
U. S. Rubber Co. com.....	54 1/2	55	53 1/2	54
U. S. Rubber Co. pfd.....	100 1/2	100 1/2	102	102 1/2
White Company pfd.....	105	110	108	110
Willys-Overland Co. com.....	58	62	83	87
Willys-Overland Co. pfd.....	79	85	90	95

after the assignment, by the St. Louis Car Co., with claims of \$2,212; and two other creditors with claims amounting to \$4. The liabilities are stated to be about \$55,000, and the nominal assets about \$25,000.

4,672 Motor Vehicles in Montreal

MONTREAL, QUE., Dec. 25—A census taken late this summer of the number of automobiles in the Province of Quebec shows 7,317 motors, 7,025 cars and 292 trucks. The city of Montreal has alone 4,422 cars and 250 trucks the remaining number being distributed throughout the Province.

Motometer Wins Appeal in Patent Suit

NEW YORK CITY, Dec. 19—The Circuit Court of Appeals has affirmed the preliminary injunction granted May 21 to Harrison H. Boyce and the Motometer Co., Inc., in its suit against the Stewart-Warner Speedometer Corp., charging infringement of patent No. 1,090,776 covering the Motometer, a device for showing cooling water temperature.

The patent in question was issued March 17, 1914 and the suit was commenced April 11, 1914. The order to show cause why the preliminary injunction should not be granted was made without notice and served on the Stewart-Warner Speedometer Corp., April 14. The latter filed its answer charging lack of invention in the Motometer patent May 1. On May 16, Judge Hand, in the U. S. District Court for the Southern District of New York, granted the preliminary injunction prohibiting the manufacture and sale of the Stewart-Warner radiator thermometer. The suit was originally brought against the Stewart-Warner Speedometer Corp. of Virginia, and the Stewart-Warner Speedometer Corp. of New York, but the Virginia corporation was not made a party to the suit, being outside the jurisdiction of the court.

Judge Rogers, of the Circuit Court of Appeals, held that, although there had been no prior adjudication of the validity of the patent, the lower court had not abused its discretion in granting the injunction. Some significant extracts from the decision follow:

"The complainant's device embodies the idea primarily of affording protection against the great evil of engine over-heating, for which previously there had existed no remedy."

"The defendant claimed that the complainant's device was anticipated by the prior art.....but an examination of the patents referred to convinces us that there is absolutely nothing in the claim of anticipation by the prior art. The prior patents do not disclose or in any way suggest the invention of the patent in suit."

"The evidence shows that prior to 1912 there was nothing known in the automobile art which would enable one running an automobile to discover an undue heating of the engine in time to rectify it and avoid irremediable damage. It was not until complainant's Motometer was invented that any instrument existed which could be used in connection with automobiles to give warning of a dangerous condition of the engine. In the face of the affidavits which were presented, the utility of the complainant's device cannot be doubted."

U. S. Tire Co. Concentrates Production

NEW YORK CITY, Dec. 21—The United States Tire Co. has decided to concentrate the entire automobile tire production in the Hartford and Detroit plants. All solid tires for motor trucks, carriages and vehicles of all sorts will be made in Providence and bicycle and motorcycle tires will be made exclusively at Indianapolis. The company will continue its policy of furnishing the G. & J. brand of automobile tires, not through its branches, but through the number of large distributing agencies handling this brand.

Crescent Delivery Car Makes Appearance

LOS ANGELES, CAL., Dec. 20—A new light delivery car has made its appearance in Los Angeles. The machine is known as the Crescent car and has been placed on the market by the Mission Motor Car Co., of the Southern California city, designed to meet the needs of the tradesman who needs a car of no greater capacity than 600 or 800 pounds.

Atwater Kent to Build New Factory

PHILADELPHIA, PA., Dec. 19—The Atwater Kent Manufacturing Works, Wayne Junction, has under way the construction of a new brick factory building adjoining the pres-

ent structure that when completed will give the company two and one-half times the present available floor space.

Nyberg Plant to Be Reopened and Operated

INDIANAPOLIS, IND., Dec. 21—The plant of the Nyberg Automobile Co., Anderson, is to be re-opened and operated at once. Albert C. Barley of Marion has acquired full control from James W. Sansberry, a banker. The company has been in litigation, Barley having filed suit against Sansberry demanding an accounting. In a compromise of this suit, Barley acquired control.

LOUISVILLE, KY., Dec. 19—Perplexity of Louisville motorists as to how to obtain their 1915 licenses was removed this week when H. L. Ramsey, deputy state commissioner of motor vehicles, attending a special meeting of the Louisville Automobile club directors, announced that an arrangement had been made with the secretary of state whereby the licenses would be issued through the office of the commissioner of motor vehicles.

NEW YORK CITY, Dec. 18—The Kelly-Springfield Tire Co. has declared a dividend of 1 1-2 per cent. on the common stock, payable February 1, 1915, to the stockholders of record at the close of business January 15, 1915. It has also declared quarterly dividends of 1 1-2 per cent. on the 6 per cent. preferred stock and 1 3-4 per cent. on the 7 per cent. second preferred stock, payable January 2, 1915, to stockholders of record at the close of business December 15, 1914.

Bretz Company Files Certificate

ALBANY, N. Y., Dec. 21—The J. S. Bretz Co., 250 West Fifty-fourth street, New York City, importer of F. & S. ball-bearings, filed a certificate of dissolution with the secretary of state on November 28.

Market Reports for the Week

This week's market reports showed a few changes in the metal, rubber and silk quotations. In the metal market, both coppers underwent a drop of \$0.00 1-8 per pound. The tone of the copper market is weak, although producing interests are still making little effort to attract business. There is small demand from the consumers and second hands are more anxious to sell at concessions. Tin also experienced a decline, a weaker tone having developed this week, in sympathy with the same in London. This metal closed at \$33.50 per 100 pounds, a drop of \$0.88. Both Bessemer and open-hearth steels, however, went up in prices, closing at \$18.50 per ton, at a gain of \$0.50. The crude rubber market this week retained a firm tone with no material change. Up-River fine Para closed at \$0.76 at a gain of \$0.03. Para is very scarce, as there is apparently little obtainable at less than \$0.76 a pound. The consumers were purchasing sparingly, and there was little doing among the dealers. Reports from London state that rubber is easier for plantation.

A report states that arrangements soon would be completed looking to a removal of the embargo under restrictions against the export of rubber from the British colonies to the United States. While the details of the arrangements have not been fully worked out the State department has been given to understand that the American importers of rubber will be required to give guarantees that none of the product shall reach Great Britain's enemies.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Change
Antimony	.12½	.12½	.12½	.12½	.12½	.....
Beams & Channels, 100 lbs.	1.21	1.21	1.21	1.21	1.21	.....
Bessemer Steel, ton	18.00	18.50	18.50	18.50	18.50	+.50
Copper, Elec., lb.	.13½	.12½	.13	.13½	.13½	-.00½
Copper, Lake, lb.	.13½	.12½	.13	.13½	.13½	-.00½
Cottonseed Oil, bbl.	5.65	5.73	5.60	5.65	5.65	.....
Cyanide Potash, lb.	.21	.21	.21	.21	.21	.....
Fish Oil, Menhaden, Brown	.38	.38	.38	.38	.38	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	3.80	3.80	3.80	3.80	3.80	.....
Linseed Oil	.50	.50	.50	.50	.50	.....
Open-Hearth Steel, ton	18.00	18.50	18.50	18.50	18.50	+.50
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	.....
Raneseed Oil, refined	.71	.71	.71	.71	.71	.....
Rubber, Fine Up-River, Para	.73	.73	.73	.75	.76	+.03
Silk, raw, Ital.	3.90	3.90	3.90	3.90	3.90	.....
Silk, raw, Japan	3.20	3.20	3.20	3.27½	3.27½	+.27½
Sulphuric Acid, 60 Baume.	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	34.38	34.38	33.50	33.50	33.50	-.88
Tire Scrap	.05	.05	.05	.05	.04½	-.00½

Repairs, 22.7 Cents per 1,000 Miles

Twenty Winton Prize Winners Drive 359,116 Miles for \$49.97

NEW YORK CITY, Dec. 18—The Winton Motor Car Co.'s seventh annual repair expense contest, begun on April 1, 1914, and ended on November 30, was won by John Grau, chauffeur for J. F. Casey, of Pittsburgh, who drove his Winton Six 24,362 miles with no repair expense. The twenty winners of Winton prizes drove 359,116.2 miles with a total repair expense of \$49.97, or an average of 22.7 cents per 1,000 miles. For the seven contests, 110 cars have traveled 1,689,076.2 miles with a total repair expense of \$383.68.

The year 1911 seems to have the best record so far as total mileage and total repair expense are compared. That year twenty cars made 394,333.9 miles with a total repair expense of \$20.88. The next best year is 1913 when twenty cars totaled 294,774.8 with a total repair expense of \$31.46. In 1910 ten drivers went 165,901.9 miles at a total repair expense of \$6.96. The first year the contest was started, 1908, ten drivers went 65,687.4 miles at a repair expense of \$15.13.

The winner receives the prize of \$1,000. The second prize of \$500 went to W. H. Franklin, chauffeur for the Boston Last Co., Boston, Mass., who drove a Winton Six 27,432.6 miles at a repair expense of \$18. Third prize, \$250, went to W. M. Newsome, who won third prize last year. His mileage with a car belonging to M. R. Hirsch, Atlanta, Ga., was 22,175 with no repair expense.

The following list gives the seventeen remaining winners, who received each a prize of \$100:

Name	Owner	Mileage	Total Repair Expense
F. C. Batt	State of New York	22,208.9	\$20.15
Thomas Brown	M. J. Finnigan, Worcester, Mass.	19,445	1.20
G. T. Maccone	F. E. Coursen, Stockbridge, Mass.	20,379	5.35
Thomas Murren	J. M. Anderson, Medford, Mass.	18,693	None
H. B. Vaughn	Celia Bell, Terre Haute, Ind.	18,385.3	None
C. D. Spiller	J. L. Bailey, Fitchburg, Mass.	18,746.8	.85
G. M. Lewis	E. R. Caldwell, Syracuse, N. Y.	18,486.8	2.10
J. W. Tracy	J. C. Biggert, Crafton, Pa.	17,026	None
F. S. Weaver	S. R. Bush, Easton, Pa.	16,579	2.32
J. J. Hickey	T. Pariseau, Manchester, N. H.	15,360	None
Hugo Larson	R. W. Stevens, Highland Park, Ill.	15,321	None
Ernest Fries	L. M. Willis, Kenilworth, Ill.	14,940.7	None
R. Clements	F. H. Jones, Andover, Mass.	14,821	None
W. E. Ochsie	Martin Daab, Hoboken, N. J.	14,057.4	None
Herbert Lewis	George Spottiswoode, Orange, N. J.	14,017	None
J. F. Kerrigan	F. W. Carter	13,865	None
M. H. Murphy	R. T. Heitemeyer	12,815	None

The judges were: J. A. Dickson, *Youth's Companion*; D. G. Newton, *Cosmopolitan Magazine*; G. C. Pierce, *Associated Sunday Magazines*; R. M. Banhart, *National Geographic Magazine*, and R. G. Howse, *Literary Digest*.

Indianapolis Seating Capacity Raised to 75,000

INDIANAPOLIS, IND., Dec. 19—Construction of a new grand stand, seating 15,000 people, has been started on the south turn of the course, raising the total seating capacity of the plant to 75,000, which is equalled only by the new Yale bowl at New Haven. Over a mile of grand stands, the longest in the world, will soon be a speedway fixture.

Additional improvements are the erection of a communal garage, accommodating forty cars, in back of the judges' stand,—the old garages having been torn down, and their site turned into parking space,—the widening of the track on the inside by 15 feet, and the erection of a concrete safety wall all around. A club house for drivers, complete with gymnasium, tennis courts, and swimming pool, are contemplated for next spring.

Omaha Speedway Opening July 5

OMAHA, NEB., Dec. 19—July 5 was tentatively selected by the management as the date for the opening race meet at the new automobile speedway here.

Chicago Speeders Give Appearance Bond—No Jail

CHICAGO, ILL., Dec. 17—No longer will Chicago motorists have to go to jail for infractions of the local ordinances which apply to the control of traffic. A new order goes into effect

January 1 which will change all this. Chief Justice Harry Olson of the municipal court, and Max Korshak, assistant corporation counsel, have approved an appearance bond which violators may sign and go on their way. The next day they must appear in court or a jury will be called and a judgment entered fining the violator. An execution then will issue and the accused either must pay or go to jail.

Republic Rubber to Open Foreign Branch

YOUNGSTOWN, O., Dec. 21—The Republic Rubber Co., this city, is going to open a European branch in London early in the new year and Frank V. Springer, manager of the railroad sales department of the company for the last 10 years, will be in charge. Mr. Springer has had headquarters in New York City. The London branch will care for continental business as well.

1 Hour Limit for Parking Detroit Cars

DETROIT, MICH., Dec. 19—Beginning December 21, automobiles found parked in front of stores and offices more than 1-hour are to be removed by the police either to special parking places or to streets where they will not interfere with the shoppers or with traffic. The owners are to be called before the traffic department officers and may be fined.

The policemen specially detailed for that work will be provided with stickers to be affixed upon the car tires. Upon the sticker the policeman will mark the time or hour when this sticker was placed upon the tire and when returning to check up the cars and upon finding cars parked beyond the allowed time of 1 hour he will have the car removed.

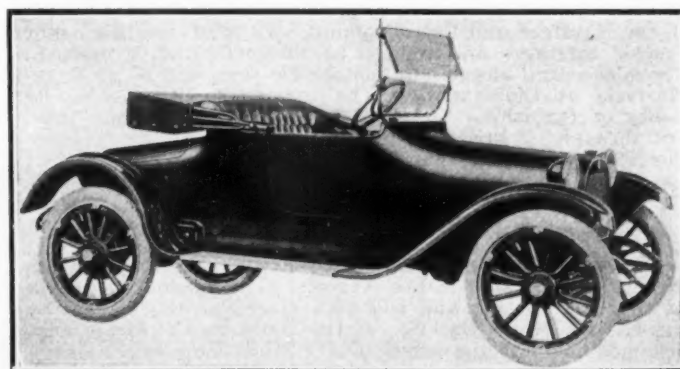
Lozier Creditors' Meeting Dec. 29

DETROIT, MICH., Dec. 19—Efforts to re-organize the Lozier Motor Co., have not been abandoned notwithstanding that 10 days ago the company was declared bankrupt. A committee of creditors acting on its own responsibility has formulated plans for a re-organization of the company and has arranged for a general meeting of creditors to be held December 29 at 2 p. m. in the United States District Court, in Detroit.

Two Petitions for Hassler Co.

INDIANAPOLIS, IND., Dec. 19—The United States Court at Indianapolis has under consideration two petitions concerning the Hassler Shock Absorber Sales Co. One, filed by Robert H. Hassler, asks for the appointment of a receiver, and the other, filed by Robert H. Hassler, Inc., Asa P. Romertson, doing business as The Auto Exchange, and the Advertisers' Press, creditors, asks that the concern be adjudged bankrupt. The state courts on November 27 appointed Homer L. Archer receiver for the company.

INDIANAPOLIS, IND., Dec. 19—Earl Cooper has been engaged by the Stutz Motor Car Co., Indianapolis, Ind., to drive for it in the Vanderbilt and Grand Prize Races which will be run at San Francisco.



Dodge Bros., Detroit, has supplemented its touring model by a roadster body on the same chassis of 110 inches wheelbase. Like the touring model, the roadster is an all-steel construction, including the frame. Doors are wide and have concealed hinges and handles, and there is a sloping rear deck with a door giving access to a spacious luggage compartment. The characteristic oval, molded fenders are fitted. Price \$785, same as touring car

Car, Truck and Accessory Plants Expand

(Continued from page 1174)

The Houk Mfg. Co., Buffalo, N. Y., added one story to the one-story machine shop for wheel assembly, giving an increase of 25,000 square feet at a cost of \$35,000.

The Hyatt Roller Bearing Co., Newark, N. J., has added a six-story and basement structure 75 by 200 feet, to provide for increased business. This gives an increase in floorspace of 150,000 square feet.

Kelsey Wheel Co., Detroit, Mich., spent \$50,000 on new machinery.

The Otto Konigsloew Mfg. Co., Cleveland, O., spent \$3,500 for new machines.

The K-W Ignition Co., Cleveland, O., has added 28,750 square feet in three buildings as follows, two one-story buildings 65 by 125 feet, and one 85 by 125 feet and an addition 25 by 75 feet. The additions cost \$55,000 and new machinery \$60,000.

The Leather Products Co., Cincinnati, O., spent \$500 for new machinery.

The Lee Tire & Rubber Co., Conshohocken, Pa., added sufficient equipment during the year to increase the output 200 tires per day making the total daily production 1,000 to 1,200 tires.

A new one-story building to be used as a heat-treating department has been added by the Link-Belt Co. to its Ewart works at Indianapolis, Ind. It is 48 by 148 feet and cost \$11,000.

About \$10,000 was expended by the Lovell-McConnell Mfg. Co., Newark, N. J., on new machinery.

A four-story addition 60 by 20 feet, and having a floorspace of 4,800 square feet has been made the plant of the Mansfield Tire & Rubber Co., Mansfield, O. New machinery to the extent of \$20,000 has been purchased.

Paul M. Marko & Co., Brooklyn, N. Y., have occupied larger quarters adding 3,750 square feet. The three-story building is 25 by 90 feet, \$50,000. Machinery, \$60,000.

One building has been added to the plant of the McCord Mfg. Co., Detroit, Mich., giving an increase of 14,000 square feet. It will be used as a storage and repair department and represents an expenditure of \$10,000. New machinery, \$6,000.

Metal Auto Parts Co., Indianapolis, Ind., has rented additional space of 8,800 square feet. New machinery, \$10,000.

The Mohawk Rubber Co., Akron, O., has added a machine shop, press room, storage building and office, totaling about 30,000 square feet, \$50,000. Machinery, \$60,000.

The New Departure Mfg. Co., Bristol and Hartford, Conn., has added a five-story and basement structure containing executive offices, light machine departments, inspection and packing and shipping departments at a cost of \$250,000. The total floor area of the company's plants is now close to 500,000 square feet.

The New Process Gear Corp., Syracuse, N. Y., has added a new heating plant and made an addition to its office increasing its floorspace 8,000 square feet at a cost of \$45,000. Machinery, \$175,000.

The Niagara Fabric Mfg. Co., New York City has added 2,500 feet at a cost of \$500. Machines \$500.

A building containing 20,000 square feet has been added to the plant of the Oakes Co., Indianapolis, Ind., at a cost of \$20,000. It will be used for machines and assembling. New machinery, \$10,000.

The Osborne & Stephenson Mfg. Co., Plainville, Conn., spent \$18,000 for new machinery.

An entire floor of 16,280 square feet has been added by the Perkins-Campbell Co., Cincinnati, O., for manufacturing purposes.

In addition to the original factory at Peru, Ind., having 175,000 square feet, the Pittsburgh Model Engine Co., Pittsburgh, Pa., has

a new factory at Pittsburgh which adds 75,000 square feet and represents an expenditure of \$600,000. Additional machinery, \$150,000.

At an expenditure of \$6,250 the C. D. Pruden Co., Baltimore, Md., has added a building 40 by 160 feet giving an additional floorspace of 6,400. New equipment, \$1,250.

A four-story addition 300 by 120 feet for building closed bodies has been made by the Racine Mfg. Co., Racine, Wis., which has also added largely to its dry kilns giving the capacity of 200,000 square feet of lumber to be dried at one time. Separate building 80 by 80 has also been added for making wood bendings. The additional floorspace totals 200,000 square feet. Expenditures on the plant amount to \$75,000. New machinery, \$25,000.

Remy Electric Co., Anderson, Ind., has bought \$75,000 worth of new machinery.

The Ross Gear & Tool Co., Lafayette, Ind., has expended \$5,000 on new equipment.

Saginaw Sheet Metal Works, Saginaw, Mich., spent \$6,000 on new machinery.

The Salisbury Wheel & Mfg. Co., Jamestown, N. Y., bought \$2,000 worth of new machinery.

Light Mfg. & Foundry Co., Pottstown, Pa., added \$15,000 worth of new machinery.

The right hand wing of the S. K. F. Ball Bearing Co.'s plant, Gothenburg, Sweden, has been added during the past year.

The Sparks-Withington Co., Jackson, Mich., added 50,000 square feet for its nickel-plating and shipping departments.

A new plant consisting of five buildings is occupied by the Standard Machinery Co., R. I. The main building is 75 by 525 feet, the heat treating building 120 feet square, gas plant 40 feet square, power plant 70 feet square and garage 40 feet square.

The Standard Thermometer Co., Boston, Mass., has added a new building 80 by 20, 3,200 additional square feet.

The Standard Welding Co., Cleveland, O., has a new warehouse 240 by 60 increasing the floorspace by 14,400 square feet and is to be used for the storage of rims and bands. It cost \$21,000. New machinery, \$25,000.

The Stewart-Warner Speedometer Corp., Chicago, Ill., has a new plant which is estimated at \$200,000.

Stromberg Motor Devices Co., Chicago, Ill., spent \$5,000 on new machinery.

Sunderman Safety Carburetor Corp., Newburgh, N. Y., has added \$1,000 worth of machinery.

Swinehart Tire & Rubber Co., Akron, O., spent \$15,000 for a new machine.

The Timken-Detroit Axle Co., Detroit, Mich., expended \$50,000 on new machinery.

Todd Mfg. Co., Minneapolis, Minn., spent \$300 on new machines.

The Van Sicklen Co., Aurora, Ill., started with 8,000 square feet and now has 10,000. It expects to move into a new two-story and basement plant extending into the adjoining buildings in the near future. New machinery, \$9,000.

Wagner Electric Mfg. Co., St. Louis, Mo., has added 50,000 square feet at a cost of \$160,000 in a four-story building 272 by 45 feet. New machinery, \$30,000.

The Warner Mfg. Co., Toledo, O., \$50,000, new machinery.

An addition of 7,000 square feet has been made to the machine shop of the Waukesha Motor Co., Waukesha, Wis., \$7,500. New equipment, \$15,000.

The Westinghouse Air Spring Co., New Haven, Conn. Machinery, \$15,000.

The Whitney Mfg. Co., Hartford, Conn., added a steel storage room 50 by 160 feet, giving an increase of 8,000 square feet.

The Willard Storage Battery Co., Cleveland, O., is building an entirely new factory which, when completed, will comprise ten buildings, containing 6 acres of floor area. An idea of the large size of the plant may be gained from the illustration on page 1153.

1914 A Good Contest Year—120 Sanctioned Events

(Continued from page 1147)

The 15, 20, 25 and 75-mile 1-mile circular dirt track records were broken by Burman in his Peugeot, the first one at Peoria, Ill., the next two at Springfield, Ill., and the last at Galesburg, Ill.

Fuel efficiency tests were gone into more extensively this year. Such companies as the Buick, Chandler, Franklin, Saxon, Moon, Carnation, Studebaker and Overland held special fuel economy tests. A Buick six made 38.9 m.p.g., and a four, Model B-25 made 22.5 m.p.g. During May the Franklin company held a nation-wide competition, the result of which showed that ninety-four cars averaged 32.8 m.p.g., the highest mileage being 51.2 and the lowest 17.2. A Chandler six made 23.7 m.p.g. and a 1915 Overland model 80 equipped with a Stromberg made 29 m.p.g. In May, 180

Saxons averaged 34.75 m.p.g. Each of the competing cars was driven 200 miles without stopping the engine. The average mileage scored was at the rate of less than 1-4 cent a mile for fuel for each passenger. The transcontinental Saxon averaged 30 m.p.g. for 3,389 miles. A number of the cars averaged more than 47 m.p.g., while the lowest was 26.7. A Studebaker six in a series of 200-mile runs around Buffalo, averaged 15.15 m.p.g. In June a Carnation made 29 m.p.g. in a 24-hour non-stop run around New York City.

Two hill-climbs were held during the year, Atlanta and Uniontown. The Atlanta climb was won by a Pope-Hartford and the record for the hill broken, time 20 2-5 seconds. A KlineKar won the 2-day hill climb at Uniontown, making the best time for the 3-mile ascent, 3.57 4-5.

Factory Miscellany

CASE Force Increased—By reason of heavy orders for tractors and motor trucks for export account, it is reported the J. I. Case T. M. Co., of Racine, Wis., has increased its force to 1,400 men and hopes to bring this number up to 1,800 by January 1. Nearly all of the export orders come from the Case branch at Odessa, Russia, and the material is for war use.

U. S. Reclaiming Works Damaged by Fire—Damage amounting to \$75,000 was recently done by fire in the United States Rubber & Reclaiming Co. plant, Buffalo, N. Y.

Morrow Plant to Be Enlarged—The plant, it is stated, of the A. P. Morrow Mfg. Co., manufacturer of automobile parts, Elmira, N. Y., will be enlarged by the construction of a shop costing about \$125,000.

Western Auto Supply Will Equip—The Western Auto Supply Co., Kansas City, Mo., recently incorporated with a capital stock of \$20,000, will equip a plant for the manufacture of automobile accessories, etc.

Goodrich Adds \$5,000 Addition—A permit has been granted by the building department of Akron, O., for a two-story addition to the plant of the B. F. Goodrich Co., to cost \$5,000. It will be an addition to plant No. 26.

Pierce-Arrow Purchases Site—The Pierce-Arrow Motor Car Co., Buffalo, N. Y., has purchased a site at Elmwood avenue and the New York Central R. R., upon which will be erected a plant for the manufacture of commercial vehicles.

New Plant for Akron—Another rubber

company will be started in Akron, O., with local men operating it, to make automobile tires. It will be known as the Rubbertown Tire Co. The capital is \$10,000. O. J. Schwab, M. Greenberger and J. F. Darcy are interested.

Jones Will Operate Two Plants—J. J. Jones, of the Jones Six Co., Wichita, Kan., announces that that company will operate two factories in that city. The old Neely furniture store building, which was purchased recently, is being transformed into an automobile factory. The company is contemplating erecting a truck factory also.

Mecca Plant in Trenton—Negotiations have been made by the Mecca Tire Co., Philadelphia, Pa., for the purchase by it of the American Lamp & Brass Co., situated on Mulberry street, Trenton, N. J. The land upon which the plant is located is 385 by 300 feet. The plant comprises six brick buildings, each 30 by 90 feet. Five of the buildings are 2½ stories high, while one is 3½ stories. The company, it is said, will begin operations in March. The concern is incorporated under the laws of Delaware for \$500,000.

Milwaukee Co. Adds—The C. H. & E. Mfg. Co., 321 Mineral street, Milwaukee, Wis., manufacturing gasoline engines, tractors, gasoline cars and portable saw-rigs and similar equipment, has awarded contracts for the erection of a new machine shop and factory building at Clinton and Mineral streets, to cost \$30,000. The building will be of brick and steel construction, 2 stories high, 100 by 100 feet in size, and will permit the output to be doubled. At the head of the com-

pany is Frank J. Edwards, president of the Kissel Kar Co., of Milwaukee, and the Edwards Motor Car Co., Milwaukee agent for the Dodge.

New Ford Plants—The Ford Motor Co., Detroit, Mich., is planning to build an assembling plant in San Diego, Cal. It has also announced a \$500,000 plant for Louisville, Ky. An architect from Detroit was in that city recently to determine the plans for a new assembly plant which is to be erected on the property of the concern at Third street and the L. & N. railroad crossing. The new structure will be four stories in height and will be similar to Ford assembly plants in other cities. It is planned to have the new building ready for occupancy when the local branch, now located at 931 South 3d street, proves inadequate for the growing business of the company in that territory.

Sphinx Plant Busy—Operations at the plant of the Sphinx Motor Car Co., York, Pa., are being gradually increased and scores of agencies, who will handle the new car, are being booked throughout the different parts of the country. It was stated by a member of the company that the combined contracts for 2,000 cars approximates \$1,000,000 worth of business. The several departments of the factory are being increased and by the first of the year will be operated to their fullest capacity. The transfer of the plant, formerly occupied by the Hart-Kraft Motor Car Co., from the receiver, Donald H. Yost, to Howard Rohrer, M. G. Hollis and G. C. Aumen, of the Sphinx company, was entered this week in the office of the recorder of deeds.

The Automobile Calendar

Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.
Jan. 2-9.....New York City, Automobile Salon, Grand Ball Room of Astor Hotel, Automobile Importers' Alliance, E. Lascaris, Pres.
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 5-7.....New York City, Engineering Societies' Bldg., Winter Meeting Society of Automobile Engineers.
Jan. 8-14.....Milwaukee, Wis., Show-Auditorium, Milwaukee Auto. Dealers' Assn.
Jan. 8-14.....Kansas City, Mo., Show.
Jan. 9.....San Diego, Cal., Road Race.
Jan. 9-16.....Philadelphia Show, Metropolitan Bldg., Philadelphia Auto. Trade Assn.
Jan. 16.....Detroit, Mich., Show.
Jan. 16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.
Jan. 20-28.....Lancaster, Pa., Hiemenz Auditorium.
Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.
Jan. 23-30.....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 25-30.....Fall River, Mass., Show.

Jan. 25-30.....Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.
Jan. 30-Feb. 6.....Columbus, O., Show, Memorial Hall, Columbus Auto Club and Columbus Auto. Trades Assn.
Jan. 30-Feb. 6.....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb.....Portland, Ore., Show, Portland Auto Trade Assn.
Feb.....Toledo, O., Show, Toledo Auto Show Co.
Feb. 1-6.....Louisville, Ky., Show, Louisville Auto. Dealers' Assn., First Regiment Armory.
Feb. 2-7.....Kalamazoo, Mich., Show, Armory.
Feb. 15-20.....Grand Rapids, Mich., Show, Klingman Furniture Exposition Bldg., Grand Rapids Herald; C. L. Merriman.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 15-20.....Bridgeport, Conn., Show, State Armory; B. B. Sterber.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Feb. 23-27.....Ft. Dodge, Ia., Show, Armory, C. W. Tremain, Sec.

Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto Dealers' Assn.; H. T. Gardner, Mgr.
Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.
Mar. 9-15.....Des Moines, Ia., Show, C. G. Van Vliet.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
April.....Calumet, Mich., Show, Coliseum.
May 17-18.....Boston, Mass., A. A. A. Annual Meeting.
May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9.....Galesburg, Ill., Two-mile Track Meet.
June 16.....Chicago, Ill., Speedway, 500-Mile Race, Speedway Park Assn.
June 25.....Sioux City, Ia., Track Meet.
July 4.....Tacoma, Wash., Road Race.
Aug. 20-21.....Elgin, Ill., Road Race.
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.

The Week in the Industry



Motor Men in New Roles

PULCHER President Wolverine Club—Martin L. Pulcher, vice-president and general manager of the Federal Motor Truck Co., Detroit, Mich., was elected unanimously as president of the Wolverine Automobile Club, at a meeting of the board of directors.

Petersilge Manager Standard Motor Truck—Emil Petersilge has become manager of the Standard Motor Truck Sales Co., Cleveland, O.

Belden Minneapolis Club Pres.—G. K. Belden was re-elected president of the Automobile Club of Minneapolis. All other officers were renamed.

Hamburg Heads Newark Club—A. V. Hamburg was elected president of the Automobile Club of Essex County, Newark, N. J. A. S. Cole was elected treasurer.

Hoopengartner Resigns from Swinehart—E. O. Hoopengartner, for 10 years branch manager in New York City for the Swinehart Tire & Rubber Co., has resigned. He has not stated his future plans.

Walton Resigns—E. A. Walton, during the last 3 years advertising manager of the Timken-Detroit Axle Co., Detroit, Mich., has resigned to return to the Burroughs Adding Machine Co., in the same position.

Tooker Advertising and Sales Manager—The American Bronze Co., Berwyn, Pa., maker of "Non-Gran" bearing bronze, announce the promotion of Marc L. Tooker to the head of its advertising and sales department.

Frampton Sales Manager—G. O. Frampton has been appointed by Cooper, the tire man, as general sales manager of the Cooper agencies at Cincinnati, Dayton, Columbus, O., Indianapolis, Ind., Nashville, Tenn., Knoxville, and Chattanooga, Tenn.

Stevens Makes a Change—H. E. Stevens has been appointed manager of the used car department of the New England branch of the Locomobile Co., Boston, Mass., following 9 years' service at the company's branch in New York City.

Kroh Gets New Appointment—Henry A. Kroh, who has been in the Boston motor field for some years, has been appointed New England representative for the Continental Asbestos Co., with headquarters at 171 Huntington avenue, Boston, Mass.

Kinnaird Columbus Club President—The annual election of the Columbus Automobile Club, Columbus, O., which was held December 14, resulted as follows: C. M. Kinnaird, president; Walter A. Pfeifer, first vice-president; C. Edward Born, treasurer, and Forest H. Tharpe, secretary.

Anderson and Brubaker Exchange Positions—A. R. Anderson has been appointed St. Louis manager of the International Harvester Co., St. Louis, Mo. He succeeded H. L. Brubaker who takes charge of the company's branch in Mad-

ison, Wis., where Mr. Anderson formerly held forth.

Changes in Boston Studebaker—H. T. Myers, for some years manager of the wholesale branch of the Studebaker Corp., Boston, Mass., has been promoted to have charge of the commercial car sales at the factory and G. N. Jordan, traveling sales representative in New England, has been appointed New England branch manager.

Carmichael Heads Star Rubber—With the reorganization of the Star Rubber Co., Akron, O., its new charter shows a capitalization of \$200,000. The newly-elected officers are: President, G. W. Carmichael; vice-president, J. W. Miller; W. E. Wright, treasurer and secretary and general manager, E. M. Caldwell. G. E. Hall was elected sales manager.

Case Superintendent Resigns—J. C. Peil, superintendent of the molding department of the South Works of the J. I. Case Threshing Machine Co., Racine, Wis., and previously for 16 years superintendent of the foundries of the Pierce Motor Co., Racine, now part of the Case interests, has resigned to become superintendent of the foundry of the Maxwell Motor Co. at Dayton, O.

Garage and Dealers' Field

Sheboygan Has New Co.—The Auto Service Co., Sheboygan, Wis., has been organized by F. F. Fuller and A. A. Freund to give repair service on all makes of cars with a full line of Ford parts.

N. Y. Eisemann Moves—The Eisemann Magneto Co. has leased large offices and repair rooms in the Chandler building, 245 West 55th Street, New York City, and has given up its other branch at 123 West 52d street.

Agent for Winona Radialite Device—The Washington state distributing agency for the Winona Radialite device has been placed with J. H. Mudie, of 750 Central Bldg., Seattle Wash. The Winona product is a device that automatically turns the headlights of a motor car.

Cincinnati Winton Moves—The Cincinnati agency of the Winton Six has moved from its former location on West 7th street to 2812 May street, Walnut Hills. The new location, which is near one of the most beautiful residence sections in the suburbs, was formerly the sales room of the Eddy Automobile Co.

Reo Agents Have Dinner—All the New England agents for Reo cars, comprising about sixty, had their annual dinner at the Hotel Oxford, Boston, Mass., last week as the guests of James M. Linscott, New England distributor, and they were addressed by J. C. Brandimore and H. G. Etabler, two of the factory officials from Lansing, Mich.

Overland Dealers Meet—The annual banquet of the Overland dealers identified with the Connell & McKone Com-

pany, Eastern Massachusetts distributors, was held last week at the Boston Athletic Association, with nearly 50 dealers present. William J. Connell was toastmaster. Col. Isaac Kinsey and Mr. Van Beaver, foreign factory man, represented the Overland Company as special guests.

Milwaukee Adds Ford Accessory Branches—Milwaukee's list of motor supply branches handling Ford accessories and supplies exclusively has been increased by two by the establishment of a Ford branch of the Auto Mart at 813 Grand avenue, and the J. J. Dougherty Co. at 803 Grand avenue. Some time ago the Auto Supply Co., 127 Second street, opened an exclusive Ford supply store at 140 Eighth street, directly opposite the new Milwaukee branch of the Ford Motor Co. All of the new Ford supply stores are within a block of the new Ford branch.

International Cyclecar Office Moved—The sales manager's office of International Cycle Car and Accessories Co. has been removed from Chicago to the factory of Woods Mobilette Co., Harvey, Ill. All matters pertaining to dealers' contracts, car shipments and orders for Woods Mobilette parts and equipment will be cared for at the office at Harvey, Ill., which is in charge of O. R. Wolfe, sales manager, and J. C. Long secretary and treasurer of the company. The executive offices of International Cycle-Car and Accessories Company will be retained as formerly at 1109 Security Bldg., Chicago, and the show room and local sales room at 1509 Michigan Boulevard, Chicago.

Engineering Students Visit Jeffery Plant—A washing machine for laundering oily cotton waste was one of many money-saving appliances that made a profound impression on a party of engineering students from the University of Kansas when they visited the Jeffery automobile works recently. The students were in charge of Dean P. F. Walker, of the mechanical engineering department, and were visiting places of technical interest in and around Chicago. The tour included the Western Electric Company's plant at Hawthorne, Ill., the generating and sub-stations of the Commonwealth Edison Company at Chicago, and the automobile factory of The Thomas B. Jeffery Co., Kenosha, Wis. J. W. DeCou, in an impromptu speech, told how waste of all kinds has been avoided in the manufacture of Jeffery pleasure cars and motor trucks. Thus the oily waste is now laundered, much of the oil is retrieved, and the consumption of waste has been cut from over 1,000 pounds to less than 100 pounds a week. The waste is now used over again many times before it has to be thrown away. Formerly, the cost of small tools, such as taps, reamers, drills, files, etc., used to reach a staggering total. By the aid of efficiency ideas, this cost has been cut 60 per cent. For instance, the installation of a file-cutting machine, by which the worn files are resharpened instead of being thrown away, has turned a heavy liability almost into an asset.

Recent Incorporations in the Automobile Field

Canada

OTTAWA—Superior Tubes and Accessories, Ltd.; capital, \$300,000; manufacture accessories. Incorporators: W. A. J. Case, J. B. Taylor, C. G. Lynch, all of Toronto.

TORONTO—Anglo-Canadian Motor Sales Co.; capital, \$50,000; automobile manufacturer. Incorporators: A. G. Browning, 6 Adelaide, east, Toronto; G. E. Buchanan and others.

Colorado

DENVER—Denver Ford Starter Co.; capital, \$50,000; manufacture of Ford and Metz starters. Incorporators: C. Miercott, A. A. Carnine.

Connecticut

HARTFORD—Charter Oak Motor Car Co.; capital, \$20,000; dealer. Incorporators: Frank Zimmerman, E. H. Harris, F. W. Lycett, of Hartford.

Delaware

DOVER—Penn Rubber Traffic Co.; capital, \$150,000; manufacture and sale of automobile tires and inner tubes. Incorporators: W. Boyd, W. I. N. Lofand, W. F. P. Lofand.

WILMINGTON—Hester Tire & Rubber Co.; capital, \$300,000; tire manufacture. Incorporators: B. H. Friel, L. A. Brownhill, G. H. Purcell, all of Wilmington.

WILMINGTON—Motor Car Repair Shop; capital, \$25,000. Incorporators: E. E. McDaniel, R. C. Pancoast, W. S. Hillies.

WILMINGTON—Pneumatic-Hub-Tire-Wheel Co.; capital, \$500,000; manufacturer of wheels and tires. Incorporators: G. J. Lampton, N. M. Rowland, L. C. Evans, Louisville, Ky.

WILMINGTON—Sterling Motor Car Co.; capital, \$10,000; manufacture and dealer in automobiles. Incorporators: H. E. Latter, W. J. Maloney, O. J. Reichard.

Georgia

ATLANTA—Tatum Carburetor Co.; capital, \$10,000; manufacturer. Incorporators: F. C. Myers, I. I. Tatum.

Illinois

ANNA—Anna Machine Shop & Garage Co.; capital, \$5,000. Incorporators: R. W. Hynes, H. P. Sealey, J. P. Hynes, H. W. Smith.

CHICAGO—Adams Motor & Mfg. Co.; capital, \$25,000; manufacture in motors and machinery. Incorporators: W. E. Adams, H. W. Beaton, T. J. Mullen.

CHICAGO—Partin-Palmer Motor Car Co.; capital, \$300,000; manufacturer and dealer. Incorporators: C. E. Heckler, Guy Guernsey, R. D. D'Autremont.

EDWARDSVILLE—American Standard Automobile Co.; capital, \$100,000; parts and accessories. Incorporators: Peter Burnhardt, C. H. Gerling, Louis Kirsch.

MOLINE—Hager & Rank Automobile Co.; capital, \$5,000; dealer. Incorporators: George Hager, Axel Sorling, R. W. Rank.

MOLINE—Moline Muffler Mfg. Co.; capital, \$10,000; manufacturer. Incorporators: Ray Pupton, A. C. Walker, E. D. Jones.

PEORIA—Fashion Electric Garage; capital, \$15,000. Incorporators: B. E. Adams, F. B. Kamarel, W. R. Bennett.

Indiana

GOODLAND—H. & D. Co.; capital, \$10,000; dealer. Incorporators: A. P. Hawn, C. A. Doland, J. E. Hawn.

INDIANAPOLIS—Delaware Tire Sales Co.; capital, \$1,500; dealer. Incorporators: C. M. Nesbit, W. T. Allen, C. L. Sawyer.

INDIANAPOLIS—Eclipse Mfg. Co.; capital, \$50,000; spark plug manufacturer. Incorporators: W. S. Brown, W. S. Brown, Jr., B. M. Franklin.

INDIANAPOLIS—Indianapolis Garage Owners' Assn.; capital, \$5,000. Incorporators: H. L. Bevington, A. W. Bowen, K. R. Vaughn and others.

Kentucky

LOUISVILLE—Co-Operative Motor Car Co.; capital, \$10,000; dealer. Incorporators: W. H. Reese, Herbert Stuber, W. R. Reese.

LOUISVILLE—Falls City Auto Co.; capital, \$6,000; dealer. Incorporators: E. C. Pearson, S. J. McElliot, John Schildt, Henry Bosse.

Maine

PORTLAND—General Transit Co.; capital, \$1,000,000; manufacturer in accessories and automobiles. Incorporators: E. E. Noble, E. V. Mann, all of Portland.

Massachusetts

BOSTON—Hood Tire Co.; capital, \$20,000; deal in any kind of tires, rims and wheel equipment for automobiles. Incorporators: E. I. Aldrich, H. C. Mason, H. E. Rose, Robert Muir, C. W. Dalley, Jr.

Michigan

DETROIT—Dewesse Auto Safety Signal Co.; capital, \$1,500. Incorporators: A. A. and I. P. Gottfield, Charles Edison, Charles Young.

DETROIT—National Electric Starter Co.; capital, \$1,000; to market Ford starters built by Disco Electric Starter Co. Incorporators: M. B. and E. K. Sulzberger, J. S. Folz.

LANSING—Reliance Service & Supply Co.; capital, \$3,000; accessories. Incorporators: E. L. Dunn, C. L. Winsor, M. B. Lipsitz.

Missouri

KANSAS CITY—Western Auto Supply Co.; capital, \$20,000; dealer. Incorporators: George Pepperdine, Lena Pepperdine, E. R. Baker.

ST. LOUIS—St. Louis Welding Co.; capital, \$150,000; to manufacture automobile wheel rims and do general metal welding, forging, machine and foundry business. Incorporators: Leo Ganahl, G. Becherer.

North Carolina

FAYETTEVILLE—Armfield-Perceval Motor Co.; capital, \$10,000; dealer. Incorporators: E. W. Percival, Jr., M. D. and D. F. Armfield.

New Jersey

PLAINFIELD—Queen City Auto Co.; capital, \$30,000; dealer. Incorporators: F. Endress, F. Waller, L. Endress.

New York

BROOKLYN—Jack London Motor Car Service; capital, \$500; dealer. Incorporators: H. L. Delatour, L. M. Denham, R. H. Sternberg, 315 Snediker avenue, Brooklyn.

BROOKLYN—Jefferson Automobile Co.; capital, \$1,000; dealer. Incorporators: J. R. Howlett, 265 Jefferson avenue, Brooklyn; T. J. Howlett, C. E. Fiske.

BROOKLYN—Kestler Auto Service; capital, \$5,000; dealer. Incorporators: Richard Kestler, Lawrence Kestler, 167 Clymer street, Bronx, New York City.

FAR ROCKAWAY—Traver Puncture Proof Tire Co.; capital, \$400,000; tire manufacturer. Incorporators: Gustav Koenig, 10 Mott avenue, Far Rockaway; P. C. Traver, J. J. Higgins.

FREDONIA—Fredonia Garage Co.; capital, \$5,000. Incorporators: Frank Appgar, Robert Forster, both of Fredonia, and Henry Lewis, Buffalo.

MT. VERNON—Albert Garage; capital, \$10,000. Incorporators: P. E. Hendrick, M. C. Hendrick, P. C. Hendrick.

UTICA—Utica Mitchell Motor Car Co.; capital, \$1,000; dealer. Incorporators: Isaac Denosky, Ida Denosky, J. W. Seton, all of Utica.

WALTON—H. S. Wakeman Co.; capital, \$3,000; dealer. Incorporators: H. S. Wakeman, M. T. Smith, W. G. Smith, all of Walton, N. Y.

New York City

Armored Motor Car Corp.; capital, \$6,000; armored automobile manufacturer. Incorporators: J. H. Allen, R. J. Bauls, R. E. Rogers, all of 2 Rector street, New York City.

Automobile & Machine Spring Co.; capital, \$10,000; automobile supplies, sundries and machinery. Incorporators: Ida and Ely Bramson, Morris Kleinburg.

C. S. and R. Co.; capital, \$50,000; to manufacture motors, automobiles, etc. Incorporators: F. T. Harbach, 3681 Broadway, New York City; J. H. Pease, 549 2d avenue, Long Island City; F. W. Ritter.

Cochran's Garage; capital, \$1,000. Incorporators: Julius Spalla, Louis Spalla, 151 Brook avenue, Bronx; John Spalla.

Cherokee Garage Co.; capital, \$10,000. Incorporators: J. F. Fay, 104 E. 117th street, New York City; James Fay, P. Weggraf.

Federal Body Co.; capital, \$1,000; automobile bodies. Incorporators: O. D. Shonnard, 246 Lenox avenue, New York City; S. Goldblatt, J. A. Cameron.

Greater New York Garage Co.; capital, \$5,000. Incorporators: A. J. Beers, H. C. and J. T. Owens, 3647 Broadway.

Grand Concourse Service Co.; capital, \$1,000; dealer. Incorporators: J. M. Ireland, M. A. Ireland, Caroline Haffen, all of 2505 Creston avenue, Bronx, New York City.

Globe Steel Products Corp.; capital, \$5,000; ball bearings and automobile parts. Incorporators: C. F. Sultemeyer, J. R. Quinn, Max Vieweger, all of 50 Church street, New York City.

Natlus Auto Renting Co.; capital, \$5,000. Incorporators: S. I. Goldberg, M. M. and J. S. Davis, 605 W. 111th street.

United Supply Stores; capital, \$5,000; accessory dealer. Incorporators: A. S. Stein, L. G. Duquet, A. W. Chatfield, 312 W. 52d street, New York City.

X Protective Co.; capital, \$20,000; to manufacture tire protecting devices and other automobile accessories. Incorporators: Isidore Neustaedter, H. J. Rosenbloom, both of 63 Park row, New York City; Alfred Alexander.

Ohio

CINCINNATI—Ford Supply Shop Co.; capital, \$5,000; parts manufacturers. Incorporators: Walter Pursell, Bruce Schoofield, A. W. Kops, H. N. Smith, T. J. O'Neill.

CLEVELAND—Ford Tire & Tube Co.; capital, \$10,000; tire manufacture. Incorporators: E. E. Rodd, C. V. Liggett, U. L. Henry, C. A. Levy, Lee Ulmer.

COLUMBUS—Fourth-Chestnut Auto Repair Co.; capital, \$10,000; garage. Incorporators: J. F. Steele, J. L. Steele, C. A. Lusch, E. T. Lusch, F. M. McSweeney.

COLUMBUS—Remington Auto Sales Co.; capital, \$10,000; dealer. Incorporators: C. M. Shira, Orrin Thacker, W. A. Jackson, W. E. Penrose, G. H. Mosier.

MIDDLETOWN—C. C. Fouts Co.; capital, \$75,000; to manufacture metal garages. Incorporators: C. C. Fouts, C. B. Oglesby, Paul Fouts, A. A. Amier.

Pennsylvania

BURLINGTON—Gamble-Waggoner Co.; capital, \$25,000; general motor car and sporting goods

business. Incorporators: J. N. Gamble and others.

SCRANTON—Scranton Automobile Co.; capital, \$100,000; to manufacture and deal in automobiles and engines and accessories. Incorporators: H. R. Shaw, Tracy Prevost, L. G. Stark, all of Scranton.

PHILADELPHIA—Standard Tire & Rubber Co.; capital, \$250,000; to buy, sell and deal in all kinds of articles used in the manufacture of automobiles. Incorporators: F. R. Hansell, G. C. Seymour, G. H. B. Martin, of Camden, N. J.

Texas

EL PASO—Lone Star Motor Co.; capital, \$25,000. Incorporators: Frank T. Pickrell, E. G. Perry and L. J. Trotti.

PORT ARTHUR—Port Arthur Garage; capital, \$3,000. Incorporators: T. P. Smith, Albert Perkins and T. E. Linn.

Virginia

CLIFTON FORGE—Interstate Garage; capital, \$1,000 to \$5,000; motor car business. Incorporators: Eugene Mathews and L. W. Farrier, both of Clifton Forge.

DANVILLE—Crowell Auto Co.; capital, \$30,000; dealer. Incorporators: A. J. Crowell, Charlotte, N. C.; A. B. Crowell.

RICHMOND—Service Sales Co.; capital, \$1,000 to \$10,000; motor cars. Incorporators: C. E. Rixford and E. J. Smith, both of Norfolk.

West Virginia

MANNINGTON—C. R. & J. I. Phillips; capital, \$10,000; automobile dealers. Incorporators: C. R. Phillips, J. I. Phillips, Mary Phillips, Ortha Phillips, Laura McCrea, all of Mannington.

Washington

BELLINGHAM—Ray City Motor Car Co.; capital, \$20,000; motor cars. Incorporators: W. A. Knight, Arthur Burgess and C. E. Abrams.

NORTH YAKIMA—Service Garage & Supply Co.; capital, \$4,000. Incorporators: W. C. L. Halsey, K. M. Woods.

SPOKANE—Spokane Cycle & Auto Supply Co.; capital, \$125,000. Incorporators: J. D. Alexander, H. A. McKellar and J. B. McKenzie.

Wisconsin

EAU CLAIRE—Taylor Motor Car Co.; capital, \$5,000; to deal in motor cars and accessories, conduct a garage and repair shop, etc. Incorporators: J. A. Taylor, F. N. Ferguson, Frank H. Stillman and Alexander McDonnell.

HORIZON—Horizon Truck Co.; capital, \$100,000; to manufacture commercial motor vehicles. Incorporators: Mackie Wells, B. M. Tallmadge and John A. Dietrich.

MADISON—Star Tire & Rubber Co.; capital, \$5,000; general motor car supply business. Incorporators: John W. Mart, C. E. Mart and Minnie Mart.

MILWAUKEE—Edwards Motor Car Co.; capital, \$10,000; to deal in motor cars. Incorporators: Frank J. Edwards, Arthur A. Mueller and Margaret Mollerus.

MILWAUKEE—Modern Stamping & Mfg. Co.; capital, \$150,000; to manufacture tools, machinery, appliances and die castings, stampings, etc. Incorporators: J. P. Foley, A. C. Jorgenson and H. F. Friedrich.

MILWAUKEE—Wisconsin Garage Co.; capital, \$20,000; to conduct a general motor vehicle business and operate a repair-shop and livery. Incorporators: George Ashley DeWitt, George A. Daly and Louis M. Kotacki.

MILWAUKEE—L. & H. Auto Sales Co.; capital, \$10,000; deal in automobiles. Incorporators: L. E. Ehrhardt, H. E. Toelle, Benjamin Ross.

MILWAUKEE—Burgett & Co.; capital, \$25,000; to deal in motor cars and operate a garage and service station. Incorporators: J. C. Cox, W. G. Burgett and F. C. Durham.

MILWAUKEE—DeWitt-Schank Motor Sales Co.; capital, \$50,000; deal in automobiles. Incorporators: G. A. DeWitt, W. G. DeWitt, E. S. Schank.

ST. CLAIR—Taylor Motor Car Co.; capital, \$5,000; to deal in automobiles and operate a garage. Incorporators: J. A. Taylor, F. N. Ferguson, F. N. Stillman, Alexander McDonald.

CHANGES IN CAPITALIZATION

District of Columbia

WASHINGTON—Matheson Motor Car Co. to Premier Motor Sales Co.

Michigan

DETROIT—Scripps-Booth Co., from \$50,000 to \$150,000.

Missouri

ST. LOUIS—Velle Motor Co., from \$10,000 to \$20,000.

Ohio

EAST PALESTINE—East Palestine Rubber Co., from \$150,000 to \$500,000.

NEW PHILADELPHIA—Ohio Sales Co., from \$20,000 to \$50,000.

Washington

WILBUR—Enterprise Garage Co.; capital, \$8,000; to operate a garage. Incorporators: E. L. Farnsworth, A. Alexander, R. H. Schriber and Bernt Pedersen.

Wisconsin

RACINE—Racine Rubber Co. to \$1,500,000.

Accessories for the Automobilist

COMBS Spring Tire—Presley S. Combs, Seattle, Wash., is inventor of a new type of tire, Fig. 1, that operates on a cantilever spring principle. The tire in reality is a demountable rim to which are securely fastened forty-eight springs of the cantilever type. At the ends of these springs are twenty-four blocks, faced with rubber to a thickness of one and a half inches. Two springs are attached to each block, one at each end. The weight of the car presses down on the springs, and in that matter produces the resiliency of a pneumatic, it is claimed. In addition to possessing long wearing qualities, the maker claims it is positively immune from skidding. It has been tried out on trucks and a series of tests are being made on pleasure cars.

The device is known as the Combs tire and will be manufactured by the Combs Auto Tire Company, temporary offices of which are at 2005 Alaska Building.

Revivo Storage Battery—A lead battery, Fig. 2, which uses a semi-liquid electrolyte is the Revivo, made by a new concern, the Kentucky Revivo Battery Co., Louisville, Ky.

The grids or plates are made very much as are other lead plates but the difference between this and other storage batteries consists in the formation and character of the electrolyte, which ordinarily consists of sulphuric acid in solution at about 1.280 specific gravity, while that used in the Revivo battery consists of a solution of sulphuric acid, a solution of sodium silicate and asbestos, in proportions to form a jelly, the asbestos absorbing and holding the solutions, and this is placed in the cells, filling the space between the plates completely. As its name indicates, it revives quickly and can be run down to 1.5 volts or less, it is said.

There are many points claimed for the Revivo dry storage batteries for vehicle propulsion over other types. It is claimed they will not buckle, corrode, scale, be injured by short circuit, spill or slop over, destroy wood work, be injured by heat or cold and require no attention other than recharging, and that they can be charged the same as a wet battery, used in any position, and will give full electro-motive force from the start, will stand overcharging without injury, complete discharge without injury, stand freezing, remain active if cells are broken, and show long life.

Sampson Repair Plug—Repairing punctures in tubes by mechanical means is the advantage offered by the Sampson Repair plug made by Stevens & Co., 375 Broadway, New York City. This plug differs from the ordinary brass plug in that it is made of soft rubber with a metal core to reinforce it. The soft rubber prevents chafing and cutting of the

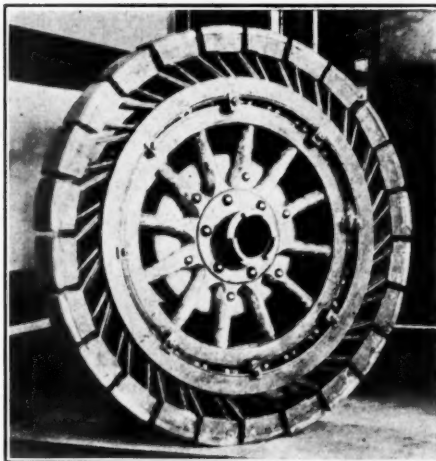


Fig. 1—Combs cantilever type spring tire

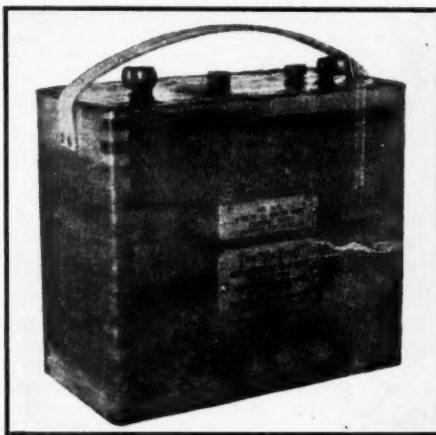


Fig. 2—Revivo storage battery

tube. The plug consists of two flat disks that are screwed together clamping the tube between them. The projecting part of the screw is then cut off with a file.

Newtype Mirror Search Light—The combination of the Newtype electric search light and a diminishing light mirror serves a double purpose in allowing the driver the use of a light where and when he wants it at night and in the day time the use of a regular mirror for seeing vehicles approaching from the rear.

Fig. 3 illustrates the mechanism of this device which comes complete with all necessary brackets and wiring attachments to the lamp so the lamp may be installed on the car in a few minutes time. The

switch is in the handle of the lamp so that the driver can turn this light off and on as desired without interfering with the other lights. By wiring this lamp direct to the battery an emergency lamp is made which can be used in case the other lights go out from wire trouble and fuses blowing out.

This lamp is manufactured by the Wood Mfg. Co., Fairfield, Conn.

Dover Emergency Gasoline Tank—A one-gallon tank for storing gasoline for emergency use is made by the Dover Stamping & Mfg. Co., Cambridge, Mass. It measures 8.5 by 3 by 12 inches, is made of steel and is protected by a wood casing. The price is \$1.

Rotobrush—This device consists of a high-speed revolving brush propelled by a water-motor. The brush is flooded with water and therefore it will quickly remove dirt from any surface. The Rotobrush is made of aluminum and sells for \$10. It is manufactured by the Edgar Mfg. Co., 104 Hanover street, Boston, Mass.

Safeguard Mechanical Hand Horn—A hand-operated horn for \$5 is made by the Duplex Electric Mfg. Co., Pittsburgh, Pa. It is enameled black and it is stated that all metal parts are made from fine heat-treated tool steel and the diaphragm from a fine grade of Swedish metal.

Keep Kool Ventilator—The Gahm Mfg. Co., Streator, Ill., has brought out a ventilator for Ford cars that allows the lower end of the windshield to be moved back so that a current of air may be supplied to the front compartment. The ventilator is easily attachable and is made in triangular shape, which makes it sufficiently strong and rigid for the most exacting service.

The adjustments can be slid forward and backward from the dashboard without loosening the adjustment which holds the windshield, so that there is no danger of the windshield slipping out of adjustment.

Freeman Self-Filling Grease Gun—A grease gun which may be simply and easily filled in a few seconds without soiling the hands is made by the Elmar Mfg. Co., Alameda, Cal.

To fill the gun, the nozzle cap is swung open and held back with the lever. Then the piston rod is drawn out its full length and while held here the handle is turned to the right until the piston rod engages the inner tube. The piston rod is pushed in again and the slotted inner tube will extend from the barrel. Then the inner tube is imbedded in the grease its full length. Turn the entire gun to the right to cut out the load. Then the filled inner tube is drawn back into the barrel by

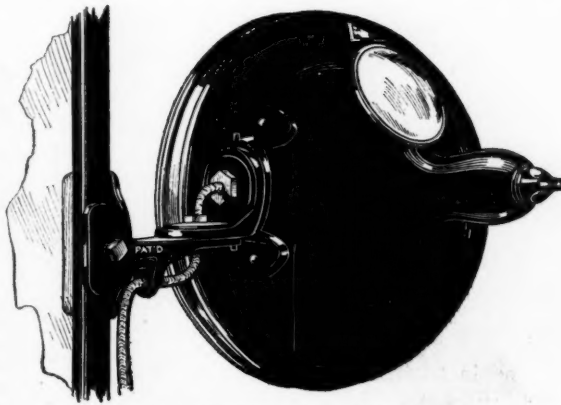


Fig. 3—Newtype mirror searchlight.

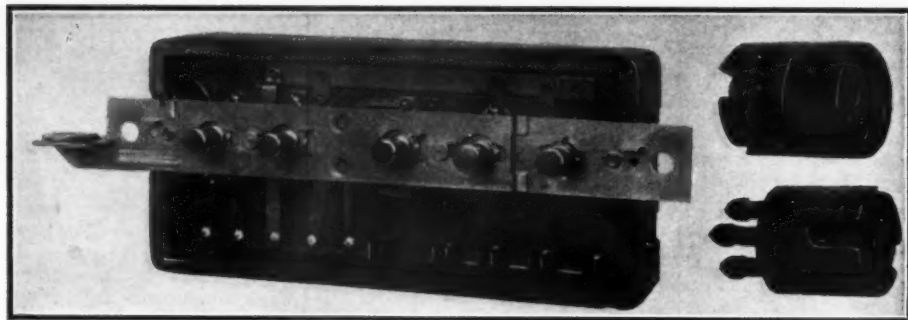


Fig. 4—Thermoplax and Pyroplax insulating materials to resist high temperatures

pulling the piston rod out again. The nozzle cap is then closed.

The price is \$2.

Hick-Meyer Deflector—A new non-glare headlight, Fig. 5, is made by the Hick-Meyer Deflector Co., Toledo, O., in which the light rays are never more than 4 feet above the ground. The light is more intense than can be produced by an ordinary lamp, it is claimed, for the reason that all the light is deflected forward and downward.

The deflector is made of special steel, shaped to fit snugly on the lower half of the light bulb, and has a mirror polish inside.

This has the effect of throwing all the light rays against the upper half of the lamp's parabolic reflector, from which they are sent forward and downward, in a safe and highly serviceable manner.

To the oncoming driver a lamp thus equipped has no glaring rays. The upper half seems well, but not dangerously illuminated while the lower half has only a faint glow.

Perfect Starter—The Perfect Starter, Fig. 6, is a one-unit device made in two sizes which operates as a motor or compressor and is placed under the hood. It is a four-cylinder machine with the cylinders arranged V-shape. As a two-stage air compressor it will provide air at 300 pounds. The complete device is very simple; there is but one shut off valve in the entire system. The seat of this valve is of special design and it is stated, will not leak even after long service.

The small starter is 8.75 by 7.63 by 4.06 inches and it weighs 55 pounds with complete equipment. It is designed for the average car. For exceptionally large motors a starter weighing 75 pounds and measuring 11 by 9.38 by 5.13 inches is used.

The Perfect starter is made by the Motor-Compressor Co., 30 Halsey street, Newark, N. J.

Accessories for the Trade

GISHOLT Periodograph—This instrument automatically keeps track of each workman's time. It consists of a master clock, a panel board for the tickets and registers throughout the shop conveniently located, for the workmen to record the time on the job. In recording his time the workman simply puts his card into a slot in the nearest register and pulls a lever once. The time spent on each job is automatically recorded. The Periodograph does not operate during lunch hour or after hours, therefore only the actual working time is taken account of.

The instrument takes its name from the principle upon which the records are made. A unit of time, usually one-tenth

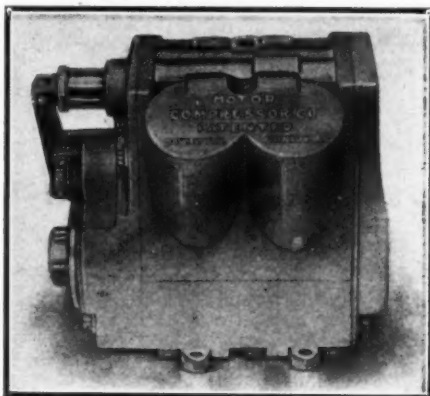


Fig. 6—Perfect starter and air-compressor with V cylinders

of an hour, is called a period, although the unit may be any fraction of an hour. These units are numbered or counted continuously throughout the working hours of the day, week or month, as desired. Distinctive overtime records are provided.

It is made by the Gisholt Machine Co., Madison, Wis.

Thermoplax and Pyroplax—Two composition insulation materials, Fig. 4, for electrical insulating work are made by the Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Thermoplax is a black molded composition insulation which will resist heat up to 600 degrees Fahrenheit, and it is stated, will not warp, shrink, expand or soften when subjected to temperatures ranging from 30 degrees below zero to 600. It has a dielectric strength of 70 volts per mil and a cross-breaking

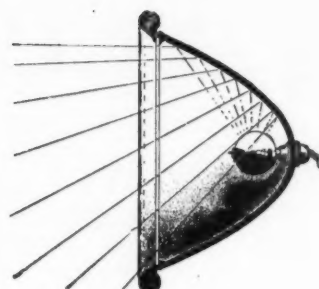


Fig. 5—Hick-Meyer deflector

strength of 1,100 pounds per square inch. It can be highly polished and may be moulded into any shape without difficulty.

Pyroplax has the same general characteristics but will resist temperatures up to 1,000, has a cross-breaking strength of 1,400 pounds and a dielectric strength of 60 volts per mil. It is made in two grades, white or plain, where intense heat is to be encountered, and brown or impregnated where a water-proof material is required.

Esterline Battery Charger—The Esterline company has perfected a dynamo, Fig. 7, suitable for charging both 6 and 12-volt batteries. The outfit is made up as nearly automatic as possible, so that it requires no attention on the part of the operator other than connecting up of the batteries and disconnecting them when they have been fully charged.

The dynamo is fitted with a pulley suitable for belting to a line shafting on an electric motor. It is fully enclosed to keep out dust and dirt and is fitted with ball bearings of large size running in oil.

The dynamos are furnished in two capacities, rated at 12 and 18 amperes respectively.

The switchboard is fitted with a zero center, nickel plated ammeter for showing the charging current; and an automatic switch for connecting the batteries to the generator and for immediately disconnecting them in case the generator should for any reason be shut down. Provision is also made on the board for connecting four batteries to the dynamo at one time.

The switchboard is 10 by 20 inches and is made for mounting on or near the wall. All permanent connections are made in the rear of the board and the battery connections on the front.

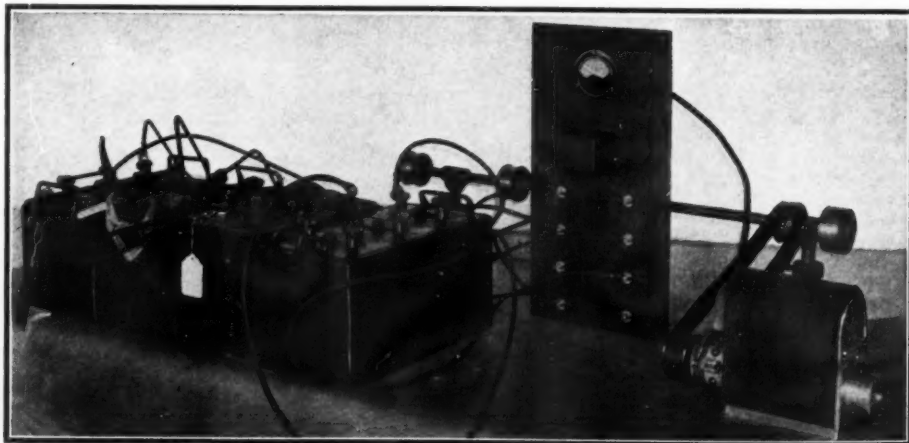


Fig. 7—Esterline charging generator suitable for charging 6 and 12-volt batteries. The generator is driven from a motor by a belt